# Adlun in the Stone Age

## The excavations of D. A. Garrod in the Levanon, 1958-1963


edited by

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*with contributions by*

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Part I

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<u>Frontispiece</u>. The Bezez Cave Excavation Team, 1963: Left to Right, Elizabeth Grimes, Diana Kirkbride, Professor Dorothy Garrod, Colonel James Skinner. (Photograph, from a colour transparency: L. Copeland).

As Dorothy Garrod particularly wished and intended,
this volume is dedicated to

GERTRUDE CATON-THOMPSON

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# PREFACE

by Suzanne de Saint-Mathurin

This final report comprises the results of excavations carried out in 1963 by Dorothy Garrod and Diana Kirkbride in the Bezez cave, at the foot of the Adlun Promontory on the coast of South Lebanon.

In her Huxley Lecture of 1962, Garrod had presented a brief account of the results she had obtained from soundings in three sites on the Lebanese coast, to which interim reports had already drawn attention. Since then Lorraine Copeland has summed up the data in various papers.

The delay in the presentation of this final report on the Bezez excavations is due to several causes. During the first half of 1968, Garrod had worked on the Bezez documents at the London Institute of Archaeology. After her death on the 18th December of that year, it was necessary to assemble her notes and to appoint an editor. John Waechter volunteered to carry this task through, but his own untimely death caused further delays. We are very grateful to Dr. Derek Roe who in 1979 agreed to take over.

I wish to record the reasons which led Dorothy Garrod to undertake excavations in the Lebanon. Ever since her work in Palestine before the Second World War, she had sought to integrate the long sequence obtained from the Mount Carmel caves within the framework of geochronology, and she hoped consequently to date with greater accuracy the Palaeoanthropus palestinus, that man in the throes of evolution, as she saw him, whose discovery had led to so much impassioned discussion. In the Huxley Lecture, Garrod had herself recalled that the dating of the Middle Palaeolithic of the Eastern Mediterranean had for long been a subject of controversy, in which many bricks had been made with very little straw. She added that in Israel the coastal plain was in subsidence under the double action of faulting in the Jordan Valley and sedimentation from the delta of the Nile: accordingly, few traces were left above ground of Quaternary high-sea levels. On the other hand, the Lebanese coast, which was relatively stable, offered to the archaeologist a providential situation. Clearly marked shore-lines, still carrying their associated beach conglomerates, had been cut into a limestone rock which also favoured the development of caves and shelters.

The promontory of Adlun had attracted the attention of archaeologists from the middle of the nineteenth century. On his return from his travels in Syria, Ernest Renan wrote: 'Si j'avais des fouilles à commencer en Phénice, après Oum Awamide, c'est Adloun que je choisirais.' These prophetic words opened the way. Over a hundred years ago, Louis Lartet, son of Edouard Lartet, had taken part in the Expedition led by the Duc de Luynes to explore the Dead Sea and had noted at the entrance of the Bezez cave some flints embedded in an ancient breccia, so hard that his pick could make no impression on it. He was the first to suspect that in this place lay 'une station troglodytique'. At the turn of the century, Père Zumoffen, Professory of Geology in the St-Joseph University in Beyrouth, picked up in the rock-shelter alongside the Bezez cave

some flints which seemed to him to be very ancient. These first discoveries were however more or less forgotten.

Garrod, who had read Zumoffen's account of what he had observed in Adlun, decided in the spring of 1954, on her return from Jerusalem, to visit the St-Joseph University to examine the Zumoffen finds, which were kept under the care of Père Fleisch, known to prehistorians for his extensive work on the Palaeolithic of Ras-Beyrouth. Her attention was immediately caught by flints of Yabrudian and Amudian typology. The presence at Adlun of artifacts that appeared at first sight to place them in an ancient phase well illustrated at Mount Carmel immediately gave rise to the hope that a correlation could be established between the two sequences. Garrod made at once the decision to undertake soundings at Adlun, in the hope of finding a link with the fossil beaches which ribbon the Lebanese coast.

Four years later, thanks to the official help of the Emir Maurice Chehab, she began her excavations in the Lebanon. They lasted from 1958 to 1964 and were carried out at three sites, the two caves of Ras-el-Kelb and Bezez and a rock-shelter close to the latter site, to which she gave the name of Zumoffen in memory of its discoverer.

In her opinion, the site of Bezez deserved the first publication because of the long sequence it contained and the presence there of abundant Acheuleo-Yabrudian material resting on a pebble beach some 15m above modern sea level.

Intermittent probing during the preceding decades had shown that in the Bezez cave, which was at one stage of its history dedicated to the cult of Astarte, the accumulation of material dating from the historical period was certainly of considerable depth. The Emir Maurice Chehab therefore decided that the excavation of the more recent levels would be undertaken by Monsieur Dunand and his team. This operation consituted what is referred to in this volume as Division I of the Bezez excavation. It covers the Phoenician and Byzantine periods. The results have not yet been published.

Garrod and Kirkbride, who were on the site while the upper strata were being cleared, took over the excavation as soon as the first signs of the Neolithic occupation appeared. Their work forms Division II, and is the subject of the present publication.

From the start, Garrod and Kirkbride wanted this excavation to be a collective work. Several of their collaborators came to Adlun at the beginning of the dig. Marjorie Sweeting, a specialist in karstic formations, studied the morphology and the evolution of the cave. The late James Skinner drew the map of the immediate surroundings and of the hanging breccias. Lorraine Copeland, to whom we owe the skilful illustration of the industries and their final analysis presented in this volume, took her first steps as an archaeologist at Adlun.

It is a matter for great regret that no absolute dating is available for any part of the sequence. Some shells that might have been usable for this purpose were found and were studied by Ian

Cornwall. We hoped that a U/Th date could have been obtained from them for the deposits containing Yabrudian, but the samples went astray and since the death of John Waechter my own search and that of Lorraine Copeland for them have remained unsuccessful. It will also be noted that a complete palynological study is missing. Madame Leroi-Gourhan was able to obtain one sample for pollen analysis when she visited the cave in 1969, but the site had long been closed and the sections were overgrown, so that no systematic sampling relevant to the stratigraphic sequence we had determined was possible.

In the actual presentation of this report, so long after it was first planned, it is inevitable that certain modifications have had to be made to the original scheme. Thus, Garrod had proposed a preliminary classification of the industry, but in 1973 a new nomenclature for the Palaeolithic of the Levant was put forward at a Symposium held at the London Institute of Archaeology, and the new terminology has therefore been adopted in this publication. Again, since the death of Dorothy Garrod, Paul Sanlaville has completed extensive fieldwork on the marine chronology of the Lebanese coast, including a reconstruction of the Pleistocene transgressions that took place during the Lower and Middle Palaeolithic occupation of the area. He has proposed the use of local names, taking into account the presence of Vermets and Strombus in the fossil beaches, while Garrod had used the 'Tyrrhenian' nomenclature current at the time of her work. We have adopted the chronology of Sanlaville in order to facilitate correlations, but one must keep in mind that Garrod could not herself control its application to the fossil beaches discovered in the sites which she had herself investigated. For the sake of broader comparisons, the Lebanese sequence in some of the tables has been tentatively equated with the old Alpine chronology, though we recognise that the usefulness of the latter is diminishing: the research of oceanographers on deep sea cores and of geomorphologists in Italy, West Germany and Switzerland has shown that long distance application of climatic fluctuations as proposed by Penck can be unreliable or even positively misleading, though for the present many will still look for these names.

Dorothy Garrod achieved her aim. More than forty years ago, she ended the main text of her monograph on Mount Carmel with these words: 'The time has now come for an effort of collaboration to bring this sequence into the framework of Pleistocene geochronology' (Garrod and Bate 1937: 124). The subsequent discovery of fossil beaches in two caves and a shelter on the Lebanese coast enabled her to tie up the Lower and Middle Palaeolithic of the Levant with the marine chronology of the Eastern Mediterranean. She had the satisfaction of knowing that a great step forward had been taken. With her usual modesty, she realised that it would not be the last. In October 1980 the University of Haifa celebrated in her memory with an international symposium the fiftieth anniversary of the excavations of Mount Carmel, and the papers read on that occasion will be published shortly. Meanwhile, the present report, in spite of the defects inherent in any posthumous publication, brings to a long-awaited

conclusion Garrod's own publication of the research project of which the work at Mount Carmel was the beginning.

At a time when Garrod was still herself digging in the Lebanon, she expressed this thought in her Huxley Lecture: "We must not forget that the first requirement is excavation, and that the digger, who is after all a trained archaeologist and not a mere handy-man, is a person who is first on the spot, and in a position to make irreplaceable observations. As in medicine, no amount of laboratory work can entirely dispense with the picture obtained by the family doctor at the bed-side."

This was not only a discreet homage to her father, but the precious legacy of a great and dedicated field-worker.

ACKNOWLEDGEMENTS

The authors' thanks are first of all due to the Emir Maurice Chehab, Director of Antiquities of the Lebanon, for granting permission for the excavations and for help in every possible way. Our work could not have been undertaken and brought to this conclusion without the generous assistance given by him and his staff.

We are indebted to the late Monsieur Henri Seyrig, Director of the French Institute of Archaeology at Beyrouth, for his unlimited hospitality, to Monsieur and Madame Dunand for co-operation in many different fields, and to Père Fleisch who showed the Zumoffen collection to Dorothy Garrod and who took her to Adlun in the spring of 1954.

We wish to express our gratitude to the British Council in Beyrouth under the Directorship of the late J.H. Grimes and to Mrs. Grimes, for constant help and their unfailing friendship; to the British Academy for their generous grant; to the British School at Jerusalem, for patronising the dig and for their generous financial support; to the London Institute of Archaeology for the provision of many facilities and for the housing of the collections; and to the Institut de Paléontologie Humaine of Paris for providing temporary accommodation.

Thanks are due to Dr. Hooijer of Leyden for his preliminary handling of the fauna, to Monsieur Georges Borgi, for his help in carrying out negotiations with local landowners, and to Madame Seyrig for faithfully performing so many tasks on our behalf.

Last but not least, our gratitude goes out to Dr. Gertrude Caton-Thompson whose encouragement at every stage, in so many ways, was an invaluable stimulus; to the late Dr. John Waechter, whose untimely death removed him from the Editorship of this report; to Dr. Derek Roe, who agreed to take over; to Dr. A.R. Hands, our publisher; and to Mr. and Mrs. S.N. Collcutt for the French Resumé.

We have refrained from listing further individual names, but we hope that the staff and volunteer helpers of the Laboratory of the Museum at Beyrouth, the American University, and all whose names cannot be listed in the Lebanon, in England and in France will accept our thanks.

Finally, I am most deeply indebted to Diana Kirkbride and to Lorraine Copeland for their constant co-operation throughout the past ten years.

Suzanne de Saint-Mathurin
Paris, March 1982

ABSTRACT

The untimely death in 1969 of Professor D.A.E. Garrod after a long illness occurred in the midst of her study of the material found during her last excavation with D. Kirkbride at Adlun in the Lebanon. This greatly delayed the publication of this volume, which represents the final report of the investigations of 1958 and 1963 at an important Palaeolithic station on the East Mediterranean shore. Two excavations were carried out, at Bezez Cave and an adjacent rockshelter, the Abri Zumoffen; these sites overlook a rock pediment covered by marine sediments, dated to the Last Interglacial by means of the included fossils (for instance the thermophile mollusc Strombus bubonius).

In the first chapter the topography and environment of the Adlun region are described. The sites are located in a limestone cliff facing the coastal plain, with the southern ranges of the Lebanese mountains behind to the east. The second chapter deals with the geological setting and immediate vicinity of the cave and the rockshelter, and discusses the karstic processes which led to the presence in them today of substituted deposits, swallow-holes, avens, and breccias. The archaeological trenches which were excavated are described in Chapter 3. At Bezez Cave, four main exposures were opened running from the front to rear of the cave; three of them reached bedrock. At Abri Zumoffen, three trenches were opened: Trench A in the rockshelter, Trench B in Zumoffen Cave, a small karstic fissure, and Trench C on the marine terrace between the two sites.

Chapter 4 is devoted to an analysis of the flint artifacts found in the cave and some of those found in the rockshelter (the rest having been published previously in 1961). The following industries were identified, in order of age. At Bezez, Acheuleo-Yabrudian occurred in Level C at the base of the archaeological sequence, in and on beach material (mixed in one small area with a possibly older 'Tayacian' facies). The industry is characterised by heavy Quina racloirs, abundant smaller racloirs, and small and medium-sized bifaces, occurring in different proportions across the cave floor. Directly above the Acheuleo-Yabrudian the Levalloiso-Mousterian Layer B occurred, truncated at the top by various agencies. The industry, with elongated Levallois points, triangular Levallois points and other laminar artifacts, resembles that of Tabun D at Mount Carmel. Breccias containing Levalloiso-Mousterian artifacts adhere to the cave walls at a higher level, indicating the presence at one time of further Mousterian layers, now lost.

Pockets of Upper Palaeolithic material (Level A), as well as breccias containing Upper Palaeolithic artifacts occurring above the level of the Mousterian breccias, indicate an occupation of Bezez Cave towards the end of the Last Glacial. The industry appears to be a Late Aurignacian, characterised by abundant bladelet-cores, some retouched bladelets, polyhedric and carinated burins, and end-scrapers. After another erosional gap of unknown length, the central swallowhole was filled by rubble and a Neolithic group using what appears to be a heavy woodworking

toolkit occupied the cave, as described in Chapter 5. The '<u>Heavy Neolithic</u>' component consists of large scrapers, planes, choppers, picks and a few axes.

At the rockshelter (Abri Zumoffen), an Amudian variant, named the <u>Beach Industry</u>, occurred on the fossil beach, overlain by <u>Amudian</u> layers separated by sterile calcrete bands. In Trench C, the Amudian occurred sandwiched between two marine episodes, the dating of which is controversial (are both from the Last Interglacial, or does the upper one belong to an early interstadial of the Last Glacial?). The Amudian is a blade industry, almost without <u>racloirs</u> or bifaces, consisting of backed and nibbled knives, burins and scrapers, apparently for cutting and slicing. The Beach Industry included chopping-tools, and there were traces of the knapping of large tools which are no longer present, in the form of Nummulitic chert flakes but few corresponding cores. Above the Amudian at the Abri Zumoffen, <u>Yabrudian</u> followed by <u>Acheuleo-Yabrudian</u> layers were found, as described in the 1961 preliminary report. These facies resemble the Yabrudian of Bezez Level C, but they lack the larger sizes of bifaces found there.

The promontory of Adlun contains traces of other Palaeolithic habitations, now ruined by quarrying and tomb-building; these are described in Chapter 6. The faunal remains are studied in Chapter 7, and a brief account of some pollen samples gives hints as to the environment, though unfortunately no datable samples were recovered.

The Adlun sites as a whole are interpreted as forming one entity, a base camp (Bezez Cave) and subsidiary sites which were inhabited (or where specialised tasks took place) in certain periods. The Acheuleo-Yabrudians are regarded as having lived in the cave around 100,000 years B.P., and the Amudian occupations are interpreted as being broadly contemporary with Bezez C. The Levalloiso-Mousterians probably lived in Bezez Cave around 80,000 B.C., the start of the Last Glacial, while the Level A Aurignacians can only be dated on typological grounds to around 25,000 years B.P. The Neolithic occupation seems likely to have taken place soon after 6,000 B.C.

The Adlun sites were chosen for excavation by Professor Garrod with a specific purpose in mind: to tie the artifact assemblages (which belonged to a series of cultures already discovered by her at Mount Carmel in a 'floating' chronology) into the sequence of Levantine Quaternary marine transgressions and regressions; these had left their traces along the Lebanese coast in the form of fossil beaches. In this way she hoped to provide a geochronological framework for the Levant Palaeolithic. The work at Adlun certainly achieved this aim, and has greatly increased our knowledge of a crucially important phase of prehistory, which saw completion of the changeover from <u>Homo erectus</u> to <u>Homo sapiens neanderthalensis</u>; as the archaeological evidence indicates, the process was of some complexity and did not occur in the same way in all Levant regions. The Adlun sites provide a secure dating for the Yabrudian/Amudian industries relative to the Quaternary sequence. Although the later industries at Bezez are not so well dated, Level A is important in providing a link between two widely separated Aurignacian

distributions, and the Neolithic assemblage shows that Heavy Neolithic toolkits could occur inside caves as well as at surface sites.

RESUME

Professeur D.A.E. Garrod est décédée en 1969, à la suite d'une longue maladie, alors qu'elle étudiait le matériel découvert pendant ses dernières fouilles avec D. Kirkbride à Adlun au Liban. Ceci explique le retard important de la parution de ce volume. Il s'agit du rapport final des campagnes de 1958 et 1963 à une importante station paléolithique sur le littoral est de la Méditerranée. Deux sites furent fouillés, la Grotte de Bezez et l'Abri Zumoffen adjacent. Ces gisements donnent sur un pédiment rocheux surmonté de sédiments marins, datés au Dernier Interglaciaire grâce aux fossiles inclus (par exemple, le mollusque thermophile Strombus bubonius).

Le premier chapitre décrit la topographie et l'environnement de la région d'Adlun. Les gisements sont situés dans une falaise calcaire qui domine la plaine côtière; à l'est s'élèvent les chaînes méridionales des montagnes libanaises. Le deuxième chapitre établit le cadre géologique et le relief du voisinage immédiat de la grotte et de l'abri et discute les processus karstiques qui produisirent les phénomènes observés aujourd'hui: dépôts effondrés, puits, avens, brèches. Les tranchées archéologiques sont décrites dans le troisième chapitre. A la Grotte de Bezez quatre coupes principales furent effectuées, depuis l'entrée jusqu'au fond, trois d'entre elles atteignant la roche sous-jacente. Trois autres tranchées furent ouvertes: la Tranchée A dans l'Abri Zumoffen, la Tranchée B dans la Grotte Zumoffen (une petite fissure karstique) et la Tranchée C dans les sédiments d'ancien rivage entre les deux sites.

Le chapitre 4 présente une analyse de l'outillage en silex de la grotte et d'une partie de l'outillage de l'abri, le reste ayant été publié en 1961. Les industries suivantes ont été identifiées et sont traitées en ordre chronologique. A Bezez, l'Acheuléo-Iabroudien se trouvait dans le Niveau C à la base de la séquence archéologique, à l'intérieur et à la surface des sédiments de plage. En un endroit cette industrie était très localement mélangée avec un facies 'tayacien' qui pourrait être plus ancien. L'industrie est caractérisée par de lourds racloirs type Quina, une abondance de racloirs plus petits et des bifaces, de petites et moyennes dimensions, présents en proportions variables à travers le sol de la grotte. Directement au-dessus de l'Acheuléo-Iabroudien se trouvait le Levalloiso-Moustérien, dans le Niveau B qui était tronqué au sommet par des processus divers. L'industrie, à points Levallois allongées, pointes Levallois triangulaires et autres pièces laminaires, ressemble à celle de Tabun D sur le Mont Carmel. Des brèches, contenant des outils levalloiso-moustériens, adhèrent aux parois de la grotte à un niveau plus élevé, indiquant la présence antérieure d'autres couches moustériennes, maintenant disparues.

Une occupation de la Grotte de Bezez vers la fin de la Dernière Glaciation est indiquée par des poches de matériel du Paléolithique supérieur (Niveau A), ainsi que par des brèches contenant des outils du Paléolithique supérieur situées au-dessus du niveau des brèches moustériennes. Il semble s'agir d'un

Aurignacien tardif, caractérisé par une abondance de nucléus à lamelles, quelques lamelles retouchées, des burins polyédriques et carénés et des grattoirs. Après une autre période d'érosion de durée indéterminée, le puits central fut comblé par des éboulis et un groupe néolithique, utilisant un outillage à pièces lourdes qui semble avoir été destiné au travail du bois, occupa la grotte. Ceci est décrit dans le chapitre 5. De grands grattoirs, des rabots, des choppers, des pics et quelques haches forment l'élément lourd de ce Néolithique ("'Heavy Neolithic' component").

A l'Abri Zumoffen une variante amoudienne, nommée l'Industrie de la Plage ("Beach Industry"), fut trouvée sur la plage fossile; plus haut, il y avait des niveaux amoudiens séparés par des bandes concrétionnées stériles. Dans la Tranchée C, l'Amoudien se trouva intercalé entre des sédiments indiquant deux épisodes marins dont la datation reste disputée: soit tous deux datent du Dernier Interglaciaire, soit le plus jeune se rapporte à un interstadiaire vers le début de la Dernière Glaciation. Pratiquement dépourvu de racloirs et de bifaces, l'Amoudien est une industrie laminaire se composant de couteaux à dos et à retouches grignotées, de burins et de grattoirs, un outillage apparemment adapté à couper et à trancher. L'Industrie de la Plage comprend des chopping-tools. Le débitage de gros outils, maintenant absents, est attesté par des éclats de chert nummulitique et par la rareté des nucléus correspondants. Au-dessus de l'Amoudien à l'Abri Zumoffen furent trouvés des niveaux iabroudiens, puis acheuléo-iabroudiens, ainsi décrit dans le rapport préliminaire de 1961. Ces facies ressemblent au Iabroudien du Niveau C de la Grotte de Bezez mais il leur manque les bifaces les plus gros.

Le promontoire d'Adlun contient d'autres traces d'occupations paléolithiques qui ont été abimées par des carrières et par la construction de tombes. Tout ceci est décrit dans le chapitre 6. La faune est étudiée dans le chapitre 7. De plus, une note sur quelques échantillons de pollen donne un aperçu de l'environnement, bien que, malheureusement, il n'y ait pas d'échantillons datables.

Les gisements d'Adlun sont interprétés en tant qu'un seul ensemble: un camp de base (la Grotte de Bezez) et des sites secondaires qui, à certaines périodes, étaient habités ou utilisés pour des tâches spécialisées. Il semblerait que les acheuléo-iabroudiens ont vecu dans la Grotte de Bezez (Niveau C) vers 100 000 B.P. et les occupations amoudiennes sont interprétés comme étant plus ou moins contemporaines. Les levalloiso-moustériens ont probablement occupé la grotte aux environs de 80 000 B.P., au début de la Dernière Glaciation. La présence des auriganciens (Niveau A) ne peut être datée que grâce à la typologie aux environs de 25 000 B.P. Vraisemblablement, l'occupation néolithique semblerait avoir eu lieu peu après 6 000 B.C.

Les sites d'Adlun furent choisis par Professeur Garrod dans un but précis: lier les industries (qui appartiennent à une série de cultures qu'elle avait déjà découverte dans une chronologie 'flottante' au Mont Carmel) avec la séquence de transgressions et régressions marines du Quaternaire levantin, séquence qui a laissé ses traces sur la côte libanaise sous la forme de plages fossiles. Elle espérait ainsi fournir un cadre géochronologique pour le

Paléolithique du Levant. Il est certain que le travail à Adlun a réalisé cet espoir et a grandement accru notre connaissance d'une phase cruciale de la préhistoire, phase qui a vu la fin de la transition entre Homo erectus et Homo sapiens neanderthalensis. L'évidence archéologique indique que ce processus n'était pas sans complexité et qu'il n'a pas eu lieu de la même manière dans toutes les régions du Levant. Les sites d'Adlun donnent une datation sûre pour les industries iabroudiennes et amoudiennes par rapport à la séquence quaternaire. Bien que les industries supérieures à Bezez ne soient pas si bien datées, le Niveau A fournit un lieu important entre deux distributions aurignaciennes largement séparées et l'industrie néolithique montre que des outillages à pièces lourdes peuvent être trouvés en grotte aussi bien qu'en site de plein air.

# CHAPTER 1
# THE REGION OF ADLUN
by L. Copeland

The prehistoric sites at Adlun are situated on the shores of the modern state of the Lebanon. Behind them to the east, the twin ranges of the Lebanon and Anti-Lebanon Mountains form the backbone of the Levant, facing west towards the Mediterranean Sea and east towards the Syrian desert (Fig.H.1).

The piedmont on the seaward flank descends precipitously to the shore, from which it is separated by a fringe of flat littoral plain. At frequent intervals along the coast this plain is interrupted by foothill ridges which drop directly into the sea, where they form substantial barriers to north-south communications. These promontories are separated from each other by the ravines of numerous rivers and streams flowing from the high mountains into the Mediterranean. Alluvium from these streams has played an important part in forming the present coastal plain, which obscures the fact that this is a drowned coastline. The bedrock topography, in fact, continues directly below present sea-level, but here it is often masked by marine deposits.

Towards the south, the height of the Lebanon mountain chain decreases gradually, and the promontories become correspondingly less formidable. On one of these headlands, half way between the ancient cities of Sidon and Tyre, stands the modern village of Adlun (pronounced Adloon). In the cliffs below, overlooking the coastal plain, which is just 400m. wide at this point, are found our prehistoric sites, Bezez Cave and Abri Zumoffen (Fig.H.2).

Substantial areas of the Adlun Promontory - which is an outcrop of harder limestone in a region of softer marly rocks - have been quarried away in recent times for use as building stone. Part of this quarry shows up on Plate S.1, left background, as a light area above the rockshelter. In Classical times a necropolis of rock-cut tombs was hewn into the cliff; this is seen on the right of the same Plate.

As long ago as 1898 the northern part of the promontory formed a 'cove', separated by two projecting arms, inside which was the rock-shelter found by Père Zumoffen (1900), and it has been suggested that it might have represented the remains of a collapsed sea cave (Garrod and Kirkbride, 1961). However, today the arms have vanished and the cliff presents a continuous face without marked protuberances (Fig.S.12, p.83). It is the base of a fossil sea-cliff which rises steeply behind the cave and shelter in several 'steps' to a height of 150m., and continues for several kilometres north and south, forming the grand escarpment littoral of Sanlaville (1977, pp.682-94). This cliff was visited many times by the rising and falling Quaternary seas; the terrace at its base is one of a series which includes many at higher altitudes - the village of Adlun sits on one, a narrow platform at c. 60m., but the most extensive is the broad platform at 150-170m. which stretches eastward towards the higher mountains (Fig.H.3).

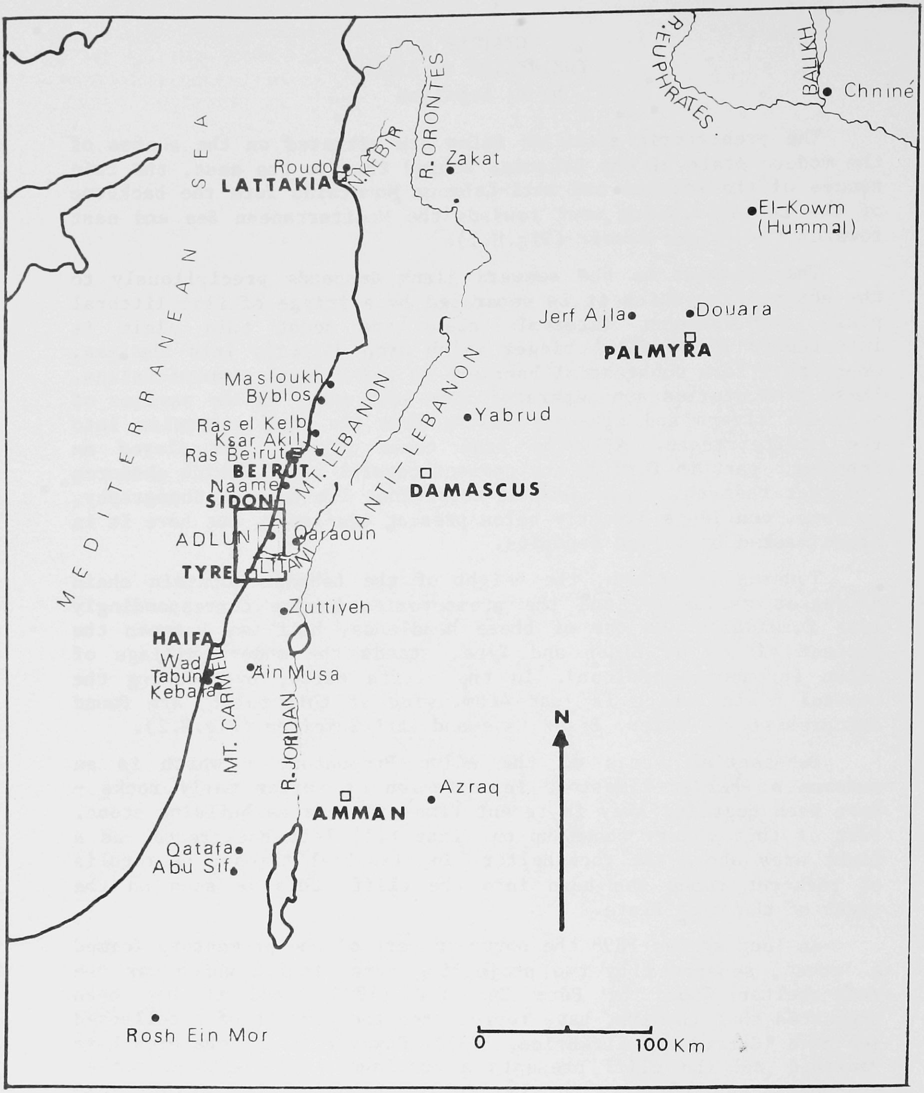



Fig.H.1. The Levant, to show the region of Adlun (inset), the principal prehistoric sites mentioned in the text (fine print) and modern towns and cities (heavy print).

Some 12km. north of the headland, a perennial stream, the Nahr Zahrani, flows into the Mediterranean, while 8km. to the south the deep ravine of the larger Litani River opens on to the coastal plain. In Palaeolithic times this ravine might have formed a natural boundary to the 'home territory' of the Adlun populations.

South Lebanon is a distinct region of the Levant, part of which is known as Upper Galilee. Together with the Galilee region of northernmost Palestine, the modern Israel, it has a climate (and consequently an environment) intermediate between that of the Lebanon proper and the more arid region of west-central Palestine. It is generally agreed that there were various north-south shifts in weather patterns during the Quaternary, and the situation at Adlun would have fluctuated accordingly between regimes typical of these two zones today. The northern Levant receives 1000mm. of annual precipitation, the coast of Israel in the Mount Carmel area only 500-300mm., while South Lebanon can be regarded as transitional with a moderate 800-600mm. The decrease in rainfall north-to-south is due mainly to the above-mentioned decrease in height of the mountain ranges, from the Lebanon (c. 3000m.) to Upper Galilee (900m.); the plateaux of the Adlun hinterland back up against mountains no higher than 700m. Therefore, the reservoirs from winter rain and snow which serve the northern regions are available in the south on a much reduced scale, and more streams and springs dry up here during the summer than in the north. It is true that there are two perennial streams in the Adlun region, which might suggest that Adlun belongs with the Lebanon regime; however, their water originates elsewhere, the Zahrani rising in the Jebel Niha (1000m.) and the Litani coming from the Beqa'a Valley, tapping a vast drainage from the Lebanon and Anti-Lebanon ranges. Nevertheless, the valleys of these two rivers would certainly have been an important resource area for the Palaeolithic hunters of Adlun.

In addition, since the area is karstic, more water than is visible on the surface is potentially available, flowing in extensive subterranean networks. (One such is the Mugharet es-Shatawi, 27km. E.S.E. of Adlun, on the estate of Shaikh Najib Alameddine, but this is completely dry during the summer.) The karstic development of Bezez itself is described in Chapter 2.

Closer to Adlun is the Wadi Abu Aswad (Fig.H.2) which issues from the plateau only 5km. south of Bezez Cave, its valley cutting through an outcrop of Turonian rocks. Upstream, it flows through softer Eocene deposits, and its drainage basin consists of an area of low relief, dissected by small but fairly wide, flat-bottomed valleys. This is in contrast to the precipitous gorges through the limestone followed, in parallel 3km. to the south, by the ravine of the Litani. One of the affluents of the Abu Aswad is the Wadi Adlun, which rises behind the Adlun Promontory to the east, and it and the whole basin of about 143sq.km. must have been intensively exploited (whether seasonally or in some other fashion) by the inhabitants of the Adlun sites.

The ecology of this basin would have depended on the climatic shifts of the Quaternary, reflected in the decline and recovery of the forest cover; that is, periods of no or relatively few trees,

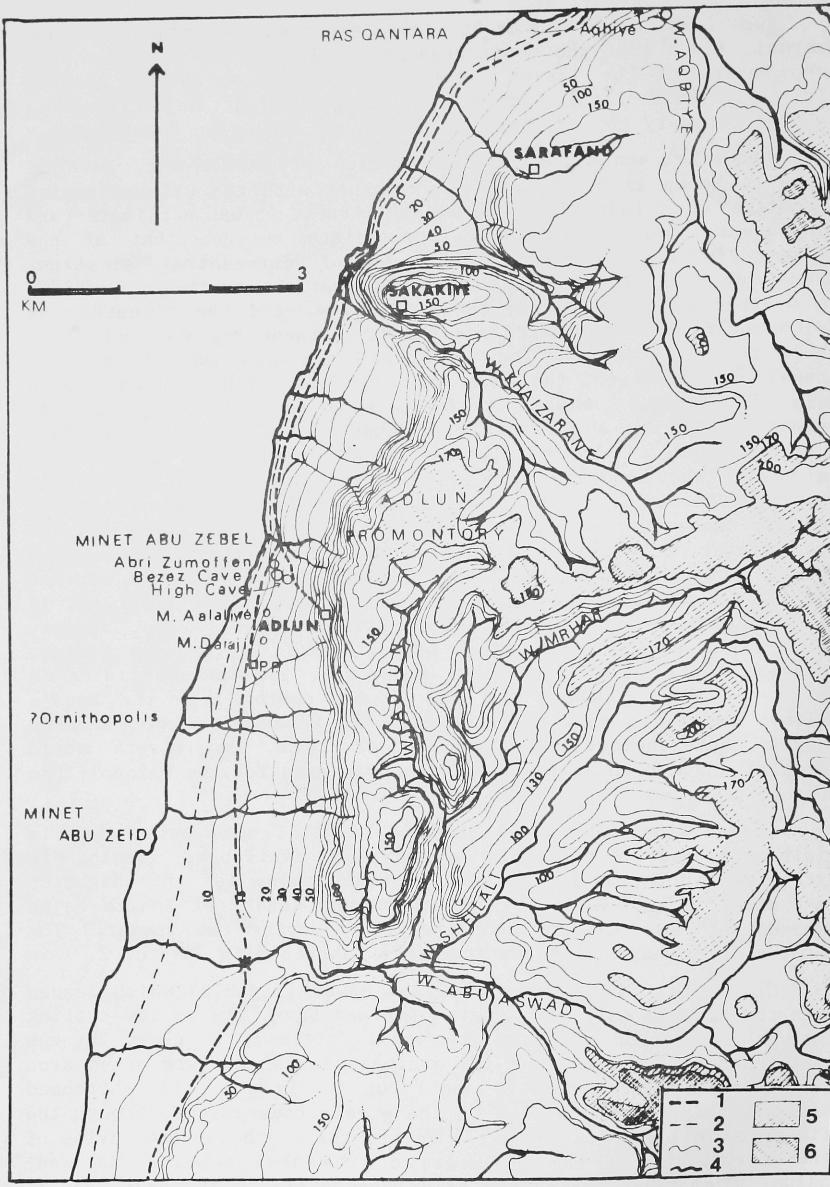



Fig.H.2. Physical features of the Adlun region today.
1: Coast road between Sidon and Tyre. 2: Railway. 3: Contours, drawn at 10m. intervals in the vicinity of Adlun, and from 10 to 50m. intervals elsewhere. 4: Wadis. 5: Land over 170m. high. 6: Land 180-200m. high. Modern villages in heavy capitals; Strombus findspots in light capitals. Ancient sites in light type.

of maquis type, alternating with periods of open oak and/or pine forest. Correlation of the former with hot and dry interglacial transgressive phases and the latter with cool and moist glacial regressive phases has been suggested, but this is a controversial subject (Horowitz, 1975-77, pp.59ff.; see also the comments published with this paper by Butzer, p.87, Farrand, pp.87-93, and Issar, pp.93-95). Judging by the flora of today's river valleys, gallery forests of plane and poplar must have always been present, but overgrazing in recent times has made the rest of the Palaeolithic landscape difficult to reconstruct with certainty; this aspect is discussed in more detail by Garrard in Chapter 7 of this volume.

There is another resource, now submerged, which would also have been available to them at certain times - an expanded coastal plain, consisting of the continental shelf, the westward extension of the headland and the ravines of the nearby streams. This would have affected the inhabitants to a minor degree during the oscillations of the Last Interglacial (Riss/Würm in Alpine terms, or Enfean in the local sequence), but to a more significant extent during the Last Glacial, when the sea-level regressed to a level far below that of today (Fig.H.3). The main features of the Levant continental platform, at least in rocky areas, consists of terraces separated by cliffs, usually at intervals of minus 5m., minus 20m. and minus 40m. (that is, 2½, 10 and 20 fathoms; references in Sanlaville, 1977, pp.133-40). The upper terrace is best known in the Tabarja area, where at 10 fathoms it is interrupted by a 6-8m. high cliff in which large caves and rock-shelter-like overhangs have been recorded. Freshwater springs emanate from this cliffline, as well as from many other submarine sources, and it is itself interrupted by canyon-like stream-valley extensions. An example near Adlun, which has been studied by Tapline in connection with oil-tanker moorings, is the submarine canyon of the Zahrani River (Goedike, 1972). However, much of the bedrock of the South Lebanon littoral is concealed by marine or aeolian sand, now cemented into beachrock or sandstone, of different ages. One cannot, therefore, use bathymetric contours, or soundings, to reconstruct the lost terrain; nevertheless the isobaths just north of Adlun are shown on Fig.H.3 to give a general idea, and we can be fairly confident that, during the Last Glacial, the Adlun sites were surrounded by dry land instead of being on the seashore as they were during the Enfean transgressions. This new dimension must have brought certain advantages, about which we can only speculate.

In contrast, during the preceding and succeeding transgressive periods, the coastal plain would shrink or even disappear entirely as it did at Adlun during the Last Interglacial, when the sea reached not only the Adlun cliff but rose to as high as 22m. above present sea-level, according to the recently published detailed study of Sanlaville; this occurred in the first part of the interglacial, called by him Enfean I. The effects of this on the Adlun prehistoric sites are discussed in Chapter 2.

In the second half of the interglacial the sea-level appears to have transgressed in stages to about 15m. and to have entered Bezez Cave (Sweeting, Chapter 2, <u>infra</u>). The early occupations at

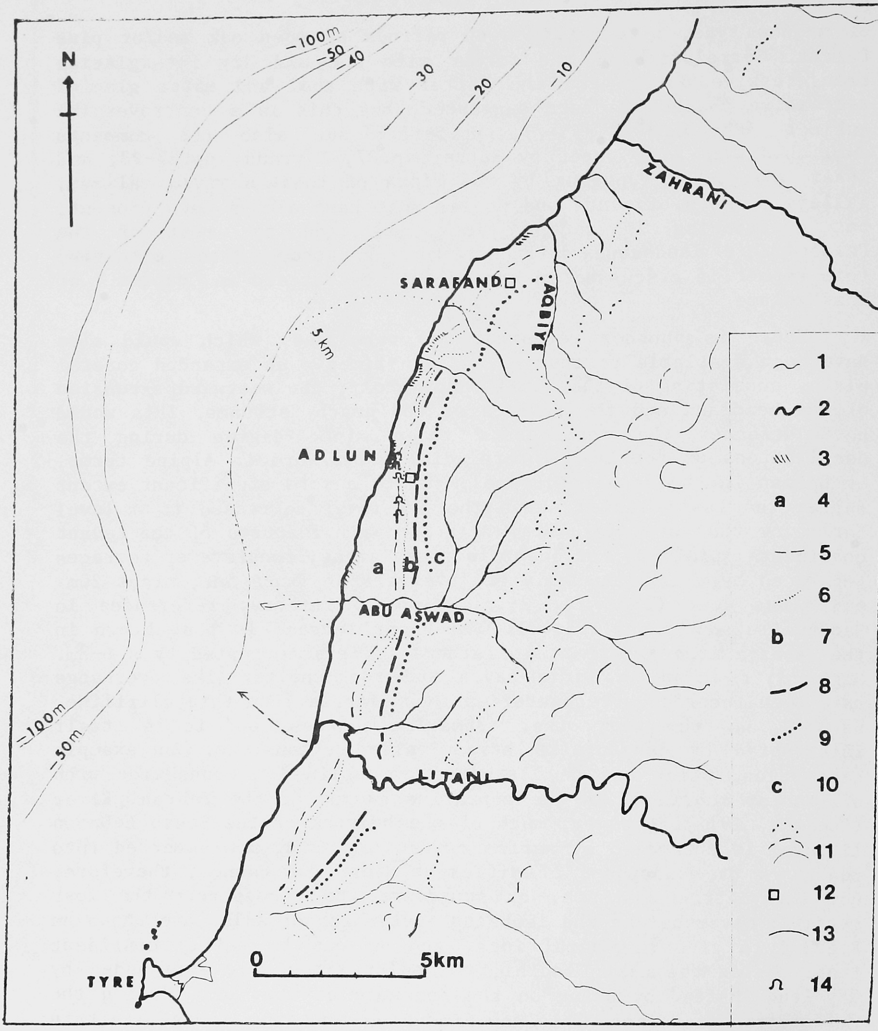



Fig.H.3. Quaternary features in the region of Adlun.

1: Modern wadi. 2: Modern river. 3: Findspot of fossil Strombus bubonius. 4: Polygenetic marine terrace, 5-20m. 5: Enfean (Last Interglacial) shoreline. 6: Polygenetic dead cliff: locus of the Adlun prehistoric sites. 7: Pre-Enfean marine terrace, 30-70m: locus of modern village. 8: Pre-Enfean shoreline. 9: Dead cliff for 8. 10: Plateau, 150-170m. 11: Dead cliffs of earlier shorelines, ascending in stages of 190, 240 and 290m. 12: Modern villages. 13: Bathymetric contours of the continental shelf; note sharp drop between minus 50 and minus 100m. Reference: 1:50,000 Levant Grid, I.G.N., Saida sheet. 14: Prehistoric caves and rockshelters. Shoreline data based on Map 9 in Sanlaville (1977). Dotted circle shows territory within a radius of 5km. from Bezez Cave at times of low sea level.

Adlun occurred in the succeeding periods of lower sea-level. Indeed, at the base of both Bezez Cave and Abri Zumoffen, the Palaeolithic artifacts rest directly in and on marine sand and pebbles (Cornwall, Chapter 3, infra), which, since they were not yet consolidated, must have only just been exposed by the retreating sea (Kirkbride, Chapter 3, infra).

Other traces of a stage of the Last Interglacial (Enfean II in Sanlaville's scheme) occur at Adlun: a distinctive deposit was laid down along the Levant shore which, although now cemented, consisted of beach pebbles of differing dimensions, sand, and the shells of Strombus bubonius Lmk., the thermophile mollusc which is held to be the type-species of this Quaternary phase. An exposure of heterometric Strombus conglomerate was recently found immediately seaward of the Adlun sites at the small inlet of Minet Abu Zebal (seen in the photograph, Plate S.15), almost at sea-level (Fleisch and Sanlaville, 1967). This is described in Section II of Chapter 3, and a list of the fauna from a similar Strombus beach is given in Appendix A, Chapter 7. The parent beaches and cliff line for these three Enfean marine phases could not be located on the present coastal plain, and it was suggested that these would probably have occurred higher up, that is, in the vicinity of the Adlun Promontory cliffs. The correlations tentatively proposed by Sanlaville place the upper two layers of Minet Abu Zebal (sand over a conglomerate with Strombus) as equivalent to the two marine layers in Abri Zumoffen Trench C, even though no Strombus was found in this small (1.70 x 1m.) exposure. The implications of this and other correlations are discussed in more detail in Chapter 3, Section II. Meanwhile it is clear that the prehistoric occupations at Adlun are connected in the closest way with the Enfean II transgressive phase.

The reader will have noticed references to such concepts as 'transgressions', 'low sea-levels' etc. which, traditionally, are based on the assumed world-wide synchronic rising and falling of the Quaternary seas in response to glacial retreats and advances. However, the idea that land surfaces are part of a 'too, too solid earth' are becoming less tenable the more we learn of the 'floating' nature of continental masses, and many of the frameworks with which geologists work today are considerably removed from those current when the Adlun sites were excavated (one example of the latter being the notion that there was a "15m. beach" of the Last Interglacial and a subsequent "6m. beach" on the Levant coast). Consequently, it has been necessary to make some adjustments to the chronology first proposed for Adlun by Zeuner et al. (1961); in its broad lines, however, this remains much the same as that suggested by the excavators. Furthermore, we shall employ some of Zeuner's terms when referring to Quaternary phases, for example 'Penultimate Glacial' for the Riss, 'Last Interglacial' for Riss/Würm and 'Last Glacial' for the Würm. Although somewhat ungainly, this system has the merit of reflecting the actual geomorphological evidence on the Levant coast and in Galilee for four successive Middle and Late Pleistocene cycles of transgression/regression or degradation/aggradation, distinguished by such field-workers as Sanlaville (1977), Michelson (1970) and

Horowitz (1975-77); these exist without respect to European sequences. The dating of the Adlun sites is discussed in Chapter 8.

A description of the Adlun region, so far as the prehistoric sites are concerned, would be incomplete without a word about neighbouring sites of comparable ages. Those in other parts of the Adlun Promontory itself will be discussed in Chapter 6.

The prehistory of the Adlun region as a whole is very little known; no detailed surveys have been carried out inland south of Sidon and Jezzine, or even in the relatively better known area around Ain Ebel in Upper Galilee (reference in Hours, 1975). Nevertheless, sites of almost every Palaeolithic and Neolithic phase have been reported, isolated from each other by tracts of <u>terra incognita</u>.

The oldest site (perhaps the oldest in Lebanon) was found 14km. north of Adlun at Borj Qinnarit, where chopping-tools, flakes and cores were extracted from a raised beach at 90m. altitude, and attributed to a Middle Pleistocene Interglacial (?Gunz/Mindel; Hours and Sanlaville, 1972). A more enigmatic site is the large station at Akbiyeh, just north of Sarafand and Adlun, reported in 1900 by Zumoffen (<u>op.cit.</u>, pp.17-18). Here, on alluvial soils adjacent to Eocene cliffs with flint seams outcropping, bifaces of Late Acheulean appearance, as well as a very heterogeneous collection of flakes, cores, picks and much <u>débitage</u> were collected. The artifacts showed various stages of patination and weathering. Some appear to be Heavy Neolithic, others Levalloiso-Mousterian, and this may represent a factory site used over several phases. An even larger and more mixed station occurs east of Sidon, and collections of Acheulean bifaces from Jezzine and Sarafand, acquired from an amateur, may be seen in the National Museum, Beirut.

A site with Tayacian-like flakes, possibly dating to the Penultimate Glacial (?Riss), was found between the Litani and Tyre: Dahr el-Aazziye; this will be discussed at the end of Chapter 4, Section I in Appendix A. The Levalloiso-Mousterian site of Hannawiyeh, a destroyed cave, was first reported by Lortet in 1880; it has suffered much the same fate as the caves south of Bezez (see Chapter 6), from which it is some 33km. distant to the south. Upper Palaeolithic sites are absent so far from the Adlun region with the exception of Bezez level A, as are Epi-Palaeolithic sites.

Various surface collections of Neolithic artifacts have been made from littoral and river-valley sites, all without any sign of habitations. Perhaps the earliest were found around the large springs of Ras el-Ain, south of Tyre, and these could be of pre-pottery date. The site of Akbiyeh, near Sarafand, has already been mentioned; its precise location is unknown, but the collection contains some Heavy Neolithic pieces and other blades and cores in the very distinctive skewbald flint so popular with the Adlun people. In contrast to the foregoing list of sites without context or without reliable samples, the important Chalcolithic village site of Dakermane, south of Sidon, excavated by the late R. Saidah (1979), provides a link with the Historic sites of the region which

are better known. The Historic period at Adlun itself was mentioned in the Preface, above.

It will be apparent from the above account that the excavations at Adlun have made a considerable addition to the hitherto poorly known prehistory of the region. In broader perspective, they help to close the gap between the Mount Carmel sites such as Tabun Cave and those in northern Lebanon and Syria. For the locations of these sites, which are important to the discussion of the various industries from Adlun, see the map in Fig.H.1.

## CHAPTER 2
## THE GEOLOGICAL AND MORPHOLOGICAL SETTING
by M. Sweeting

The Mugharet el Bezez and the Abri Zumoffen are situated in limestones (Nummulitic) of lower Tertiary age (de Vaumas, 1954, plate 1). In the neighbourhood of the caves the general dip of the limestones is about 3-5° to the west; however, in a quarry about 200 metres east of the Bezez, the beds are slightly folded and flexured. The limestones are pure and massively-bedded, most beds being about ½ to 1 metre thick, but beds up to 2 metres thick occur occasionally. The beds appear to be relatively homogeneous and shale bands are rare.

There are four main divisions in the relief of the area in the neighbourhood of the caves. These are shown in Fig.G.1, and are as follows:

a) The flattened spur with traces of the 30m. beach.
b) The old cliff line.
c) The rock pediment at the foot of the cliff.
d) The relatively flat alluvial, coastal plain.

a) At between 25 and 35m. above the present sea-level, there exists a relatively flattened spur sloping at about 5-6°. On this spur, and in a quarry cut into it, there are distinct traces of a raised beach deposit. This deposit is at 29-30m. and is presumably the remains of part of the 30-60m. Tyrrhenian I or Jbailean beach complex; it is regarded by Sanlaville (1977) as of pre-Enfean age.

b) The cliff line consists of nearly vertical or very steep parts, alternating with more gently sloping parts, and extends over a total height of about 12 metres. It is in part an old marine cliff-line but its original form has been much altered by quarrying and it is difficult to see the extent to which it has been shaped by marine and by subaerial forces. Traces of the 15m. beach (Tyrrhenian II or Enfean I) are associated with the cliff. Some solutional evidence suggests that the cliff has been weathered during a wetter climate than now, and it is clearly of polygenetic origin.

c) In certain areas an apron-like rock-cut pediment, of about 8-9° slope, occurs at the foot of the cliff. Elsewhere this pediment is missing and the cliff abuts directly on to the coastal plain. Remains of beach deposits at 12-13m. (Enfean II) have been found associated with this pediment, near the entrances to both the Bezez cave and the Abri Zumoffen.

d) The flattest element in the relief of the area is the coastal plain, which falls at an average slope of about 1:50 from about 10m. to the present sea level. As indicated above, it may join either directly on to the cliff or on to the pediment. The coastal plain has been much altered by man's activities. Traces of a beach at 6m. (Tyrrhenian III or Naamean) have been found on the coastal plain (Zeuner <u>et al.</u>, 1961).

The opening of the Mugharet el Bezez (plan, Fig.G.3; section, Fig.G.4) is situated within the cliff at its junction with the

rock-cut pediment, the height of the floor at its present entrance being approximately 16m. above sea-level. The Abri Zumoffen, which consists of a shelter and a small cave adjoining, is situated at between 12-14m. above sea-level.

Both caves are associated with the cliff-line. Despite the fact that the cliff and also the caves themselves have been affected by wave action, there are indications that the caves were formed essentially by the erosion of underground waters, rather than by marine erosion. This conclusion is contrary to the opinion expressed by Fleisch (1956, 101-32). My reasons for thinking this are twofold. First, the cliff-line marks the demarcation zone between 'the mountain' and the coastal plain, a zone within which much cavern development would be expected. Rainfall and streams originating in the mountainous area to the east sink into the limestone beds which form the mountains; this underground drainage emerged in the past as large springs along the mountain border. The slight folding of the limestones and hence greater number of fractures in the neighbourhood of the Bezez referred to above may have concentrated the underground water in this sector of the mountain border; this would account for the highly cavernous nature of the limestones surrounding the Bezez and the Abri Zumoffen.

Secondly, both caves show features normally associated with erosion by underground streams. In particular, the roof of the Mugharet el Bezez has an arched cross profile and also swirl holes formed by underground waters under considerable hydrostatic pressure (Figs.G.3, G.4). Moreover, the shape and disposition of the cave passages, and in particular of the small ramifying passages at the eastern end of the Bezez, suggest that they are more likely to have been formed by underground fresh water than by marine erosion.

The situation of the caves and also their dominantly horizontal type passages make it likely that they have been formed by underground water in close association with the horizontal movements of a ground water-table. Such movements would be controlled to a large extent by the fluctuations of the sea-level. Hence, the Pleistocene movements of sea-level, as recorded in the raised beaches, are of the utmost importance in any discussion of the formation and development of the caves. The sequence of the raised beaches and sea-levels along the Lebanese coast has recently been published by Sanlaville (op.cit.) and their archaeological chronology has been discussed by Copeland (1975, and see also infra, Chapter 4, Sections I and II).

## THE EROSIONAL HISTORY OF THE CAVES

The Mugharet el Bezez must have originated, at least in a very elementary way, during the early stages of Tyrrhenian I (i.e. pre-Enfean) before the period of cutting of the 30m. beach platform. Bedding planes and joints in the limestones would have been filled with phreatic water (Sweeting 1972, Chapter 8). Solution of the rock would be active along the most conspicuous bedding-planes and along the major joints. A network of small passages, of roughly circular or elliptical transverse sections, would have existed, as shown in Fig.G.2(a).

Later during the period of the 30m. sea level the platform above the cave was cut. The network of cave passages may have become transformed by the erosive action of more concentrated water-flow into a cave of corridor type. As a result, one cave passage became dominant and became the ancestor of the present Bezez cave. Much underground water drained through this early Bezez cave, and this water may have issued as a submarine spring off the coast in 30m. beach times. This main cave passage would be situated just below the water table and be still completely water filled (the paraphreatic stage, Fig.G.2(b)). Turbulent and swirl erosion may have modified the originally circular roof to a more arch-like form. Furthermore, lines of weakness in a vertical direction would be enlarged and along one of these a dome pit or aven was formed; this is where the light-hole is found at the present time.

During the regression from the 30m. beach level, the sea level dropped, presumably by stages, to about 15-20m. above the modern beach in Enfean (Ib) times (Sanlaville, op.cit.). As the sea level dropped, so also would the water-table within the limestones. As this took place, the cave passages associated with the Bezez became drained and the main cave of the Bezez itself would have become a river cave. The coast line probably extended to the west of the present cliff line.

The elucidation of the history of the Bezez as a river cave is assisted by the presence of conspicuously widened parts or wall "niches", which alternate with parts where the cross section of the cave is narrower. These wall niches occur at heights approx. 5m., 3m. and 2m. above the present cave floor (Figs.G.2(c) and G.4).* These wall niches indicate different phases in the history of the cave when for various possible reasons a greater degree of solution of the limestone took place. Such greater solution might first be due to differential solubility of the limestone. Secondly, differential solution might also be caused by sea-level changes. It could be expected that as the water-table dropped, so the Bezez cave river would cut down to successively lower levels. The wider cross sections could then have formed during periods of relative still-stand in the lowering of the river level (and hence of the water-table), when the river was able to cut a wider cross section; the narrower parts of the cave would accordingly indicate periods of more rapid downcutting of the river, when the water-table was being lowered more rapidly. Thirdly, climatic change could also be involved. During conditions of greater rainfall, the volume of the Bezez cave river would be larger, and more solution of the limestone might be accomplished; under these circumstances, the wider niches would correspond to the period of greater rainfall and the narrower parts of the cross sections to the drier periods. Until more work is done on the detailed morphology of the caves it is not possible to say which of these factors, lithology, pulsating sea-level or climatic fluctuations, was the more important in the history of the Bezez.

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* Zeuner regarded two of these wall niches as "ancient karstic channels" at heights of 17.37 and 18.80m. above sea-level (Zeuner et al., op.cit.). As the writer has indicated, their explanation is not simple.

As a consequence of the falling in the sea-level and of the lowering of the water-table during the regression from the 30m. beach to the Enfean (Ib) 15m. stage, the main circulation of underground water became established well below the Bezez. Much of the withdrawal of the water would take place by way of vertical joints and lines of weakness in its floor. In this way the shafts later to become so important in the floor of the Bezez were initiated. The circulation of the water below the main cave formed new substantial passages at lower levels. Passages formed at this time include that which must lie beneath the Bezez and also probably part of the small cave passage in the Abri Zumoffen, which is at a lower altitude than the Bezez. Such caves would have a similar relationship to the Bezez, in 15m. beach times, as the Bezez did to the 30m. platform in 30m. times (Fig.G.2(d)).

The cliff into which the Bezez opens may have stood formerly somewhat to the west of its present position. It has been trimmed back by marine erosion, and the cave mouth broken into, probably during the transgressions and regressions from 20-13m. (Enfean stages). Deposits of the 15m. beach occur on the floor of the Bezez, which indicates that the 15m. sea entered the cave for a reasonable period of time. The morphology of the cave suggests, however, that by the time it was entered by the sea, it had more or less acquired its present form and had become a "dead" cave. Although horizontal passages at a lower level were well developed, enlargement of the vertical joints must have proceeded slowly to enable the 15m. beach deposits to accumulate.

It is difficult to estimate the extent to which Bezez was altered by erosion caused by the 15m. sea. The beach deposit is made up of pebbles and only small amounts of sand, similar both to the modern beach and the other fossil beaches in the Lebanon. In coastal limestone areas, like that of the Lebanon, beaches commonly consist of relatively large pebbles, as can be seen for example along the limestone (Adriatic) shoreline of Jugoslavia. Limestone blocks, when attacked by the sea, become rounded by solution into pebbles and do not comminute into smaller fragments or leave sandy or clayey detritus. Therefore, the presence of a pebble beach within the cave does not necessarily imply either strong wave action or substantial marine erosion. Moreover, many of the rounded pebbles now contained in the 15m. beach may have fallen from the roof of the cave as angular fragments and have become subsequently rounded more or less in situ by solutional action of cave waters and of the sea. It is noticeable that the beach pebbles taken from Trench G have a higher index of flattening than those from Trench M (Table G.1).

Throughout the period of time following the withdrawal of the sea from the 30m. level, atmospheric water was able to percolate along the surface joints in the limestone, tending all the time to weaken the roof of the Bezez, particularly in the area of the dome-pit. By 20m. beach times (Enfean Ib), the roof of the dome pit was probably very thin and it had probably collapsed by the time of the first occupation (Bezez C).

We know from the archaeological evidence, following the regression of the sea from the 15m. level, that the Bezez became

suitable for human occupation. A raised beach which occurs at the entrance to the Abri Zumoffen, at 12-13m., may represent a stage in the withdrawal of the 15m. sea. There is evidence of both depositional and solutional phases taking place within the caves during this regression. The deposition is recorded in the hardening and cementation of the beach pebbles and in the massive stalagmite which occurs near the "Robbers' Hole" in the Bezez. The solutional phases can be seen in the Abri Zumoffen, where, some 1-2 metres below the level of the main cave, small cave passages occur into which unconsolidated deposits from the Abri Zumoffen beach have collapsed (Fig.S.13); the passages must have been formed after the deposition of the beach and some small scale solution of the limestone must therefore have taken place during the regression of the 15m. sea level. Both deposition and solution indicate cool humid conditions in the Mediterranean, which the following phase of low sea level tends to confirm (Butzer, 1964, Chapter 13).

It is believed that before the establishment of the next recognisable beach level, the Naamean at 8-10.5m., the sea withdrew to about its present level (Fleisch, 1956, pp.101-32; Sanlaville, 1973). There would be two main consequences of this. First, the water table in the area of the caves would be considerably lowered. Cave passages which had been formed below the Bezez during the 15m. still-stand might well now also be above the water-table and have become dry caves. Secondly, during the period of low sea-level, the climate is likely to have been wetter (Butzer, loc.cit.); rain and percolating waters would accordingly be more able to attack the cracks and joints in the Bezez limestones. Thus it is possible that the gradual subsidence of the 15m. raised beach deposits, and of the archaeological layers, into the widened joints in the floor of the Bezez, and into the cave passages below, began during this period of low sea-level. This collapse took place after the Levalloiso-Mousterian, during the Upper Palaeolithic and before the Neolithic; once it had started, the subsidence could have gone on for a relatively long period of time. Under these conditions also, the roof of the Bezez would undergo further collapse and the light hole would be enlarged. Evidence of slow subsidence of this kind is fairly abundant (Brink and Partridge, 1965, 47, pp.11-34).

The sea is believed to have returned to the Naamean 8-10.5m. level during the following warmer phase, possibly one of the early Würmian interstadials (Garrod, 1962). A further cold phase is assumed to have occurred following a regression from the 8m. high sea-level, possibly representing the early Würm II.

Before the archaeological excavation, the Bezez contained much cave breccia; cave breccia is usually assumed to have formed during cold and wet phases in the Mediterranean (Butzer, loc.cit.). From the evidence given above, the cave breccia could have been formed in one or other (or both) of the cold phases which occurred subsequent to the high sea level of the 15m. stage.

Since the last cold phase and the last period of formation of the cave breccia, not a great deal has happened to either the Bezez cave or the Abri Zumoffen. This is characteristic of caves well above the water-table in the Mediterranean today. Percolating waters have helped to cement the breccia into a hard rock, and

isolated fragments of limestone have fallen from the roof. In winter, drops of water percolate through the relatively thin roofs of the caves; stalagmite and stalactite formation, though slow, is still taking place. Drips of water falling through the roof of the Bezez were collected from the position of an actively growing stalagmite. Analyses for calcium content of the water gave the following result:

Ca grams/litre: 0.09/90 p.p.m.
Ma grams/litre: a trace.

These figures indicate that quite a significant amount of solution of the limestone is taking place today, at least during the wetter winter months.

A NOTE ON THE PEBBLES FROM THE MODERN AND RAISED BEACHES

About 100 pebbles, of average length 4-6cm., were collected from each of the sites named in Table G.1. All the pebbles measured were derived from the limestone beds. In the time available, it was only possible to obtain measurements to calculate the index of flattening. The indices of flattening were calculated according to Cailleux's method (Cailleux and Tricart, 1963, Vol.I) and are given in Table G.1. The figures show a general agreement in their unimodal distribution and in their indices, which are characteristic of gravels of marine origin. It is perhaps significant that the pebbles collected from the 15m. beach inside the Bezez have a high index, since pebbles collected from caves normally have a higher index than those found in non-cavern environments; this bears out the impression obtained from other features that actual marine erosion in the Bezez has been relatively slight. Measurements of fluviatile pebbles, also of limestones, from N.W. England, are added for comparison. The pebbles which come nearest to having a fluviatile index are those of the pre-Enfean beach at 30m.

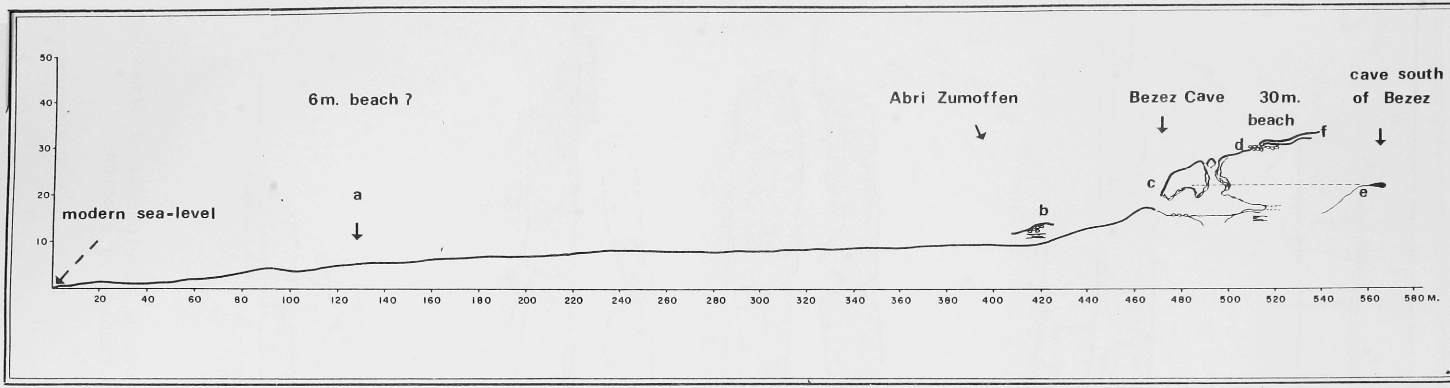



Fig.G.1: Surveyed section, modern sea-level to the area of the Adlun Promontory above Bezez Cave

a: Probable 6m. level; Naamean (Neo-Würm or Würm Interstadial); b: Enfean II 10-12m. beach, on terrace in front of Abri Zumoffen; c: Polygenetic cliff, Enfean I, 15-17m. above modern sea-level; d: Pre-Enfean raised beach, 22m.+ and above; Last Interglacial?; e: Eroded cave south of Bezez and path to it through Necropolis; f: Stone house above Bezez, c.33m. above modern sea-level (see also Fig.P.1).

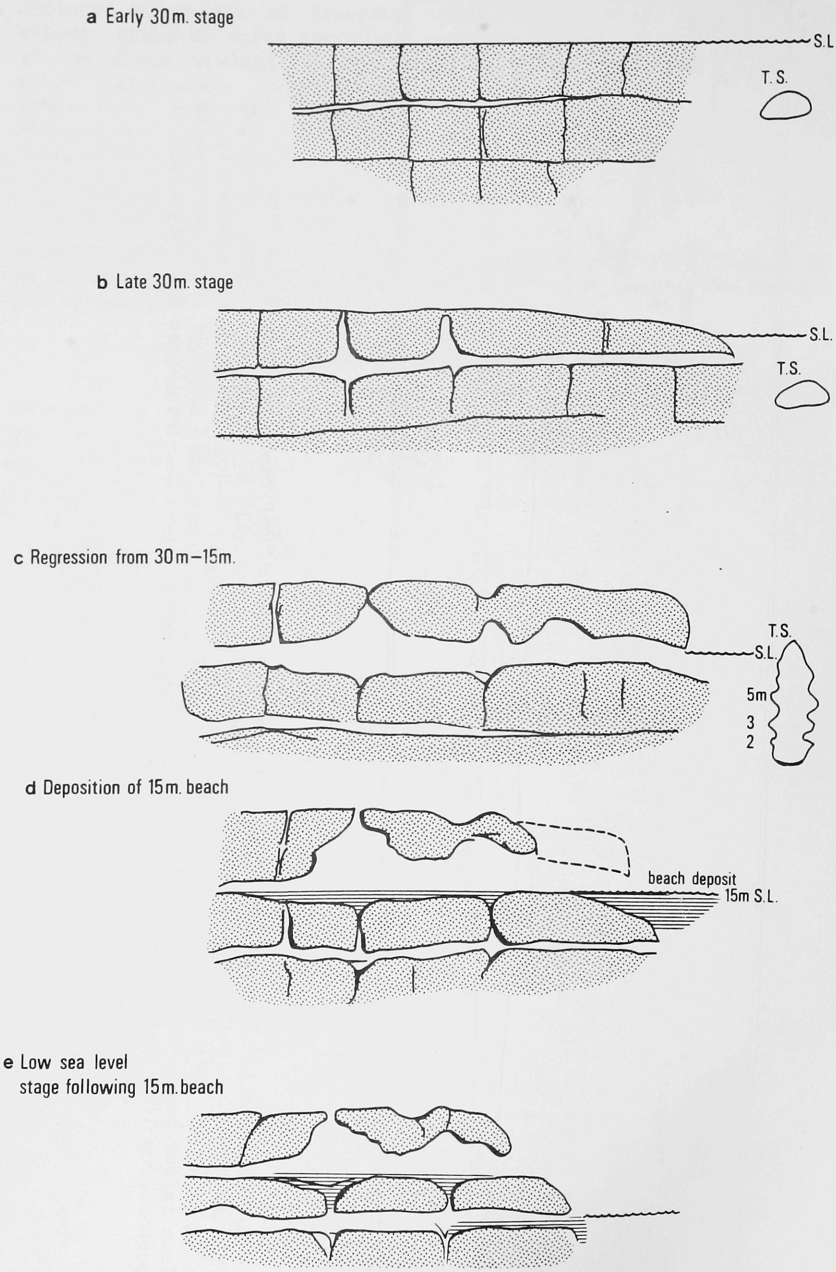



Fig.G.2. Schematic Model of the Development of Bezez Cave.
S.L: sea level; T.S: transverse section

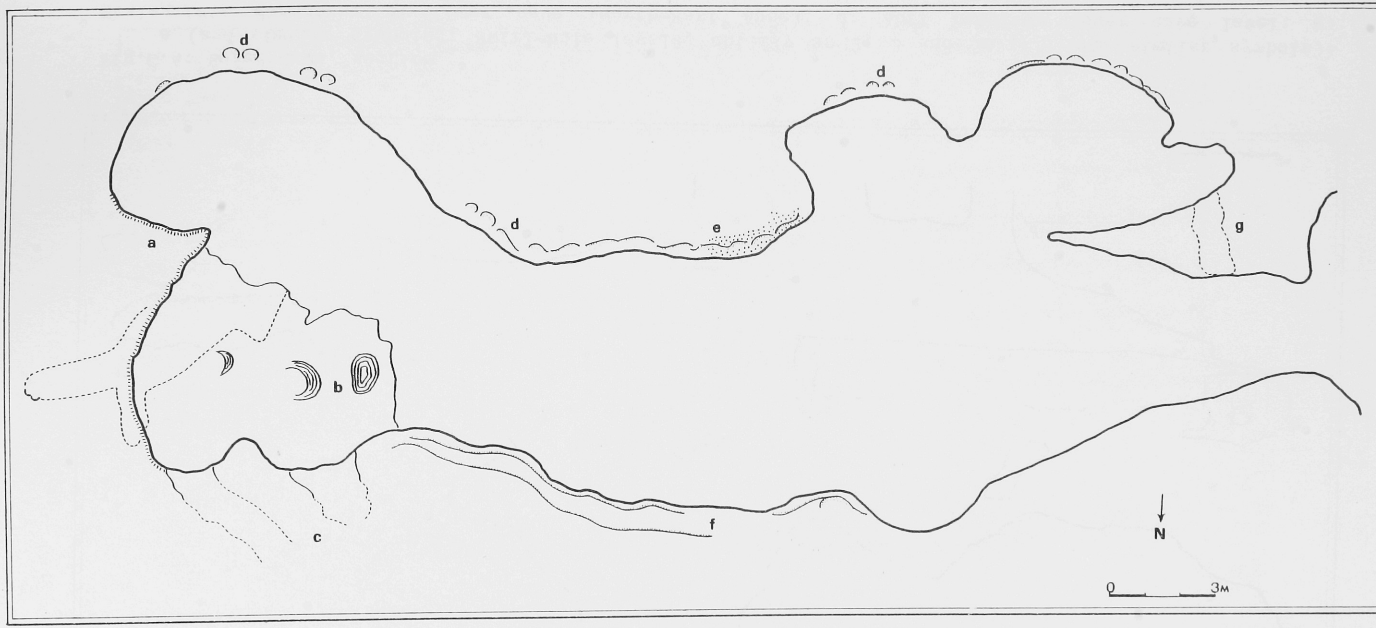



Fig.G.3: Bezez Cave, plan
a: Lower hall; b: Rock-pools and hollows; c: North-East Apse caves; d: Swirl-hole levels, chiefly at 2, 3 and 5m.; e: Stalagmite deposits; f: Ledges at 2 and 5m.; g: Swirl-hole.

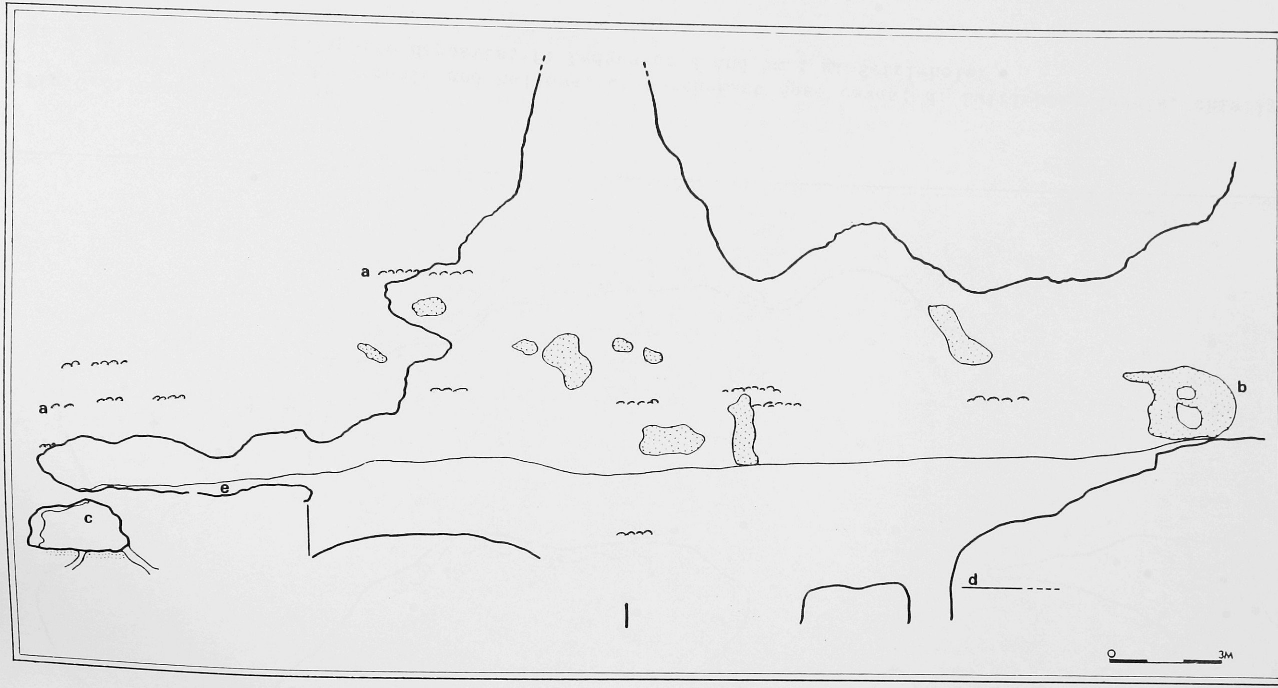



Fig.G.4: Bezez Cave, section
a (and similar symbols): Swirl-hole levels, chiefly at 2, 3 and 5m.; b (and similar symbols): Stalagmitic deposits; c: Lower cave (North-East Apse); d: Abri Zumoffen lower cave level; e: Rock-pools.

| | Mean | 1.0-1.5 | 1.6-2.25 | 2.26-3.37 | 3.38-5.06 | 5.07-7.59 |
|---|---|---|---|---|---|---|
| Abri Zumoffen | 2.18 | 12 | 50 | 34 | 4 | - |
| Bezez: Trench M | 2.35 | 4 | 45 | 46 | 7 | - |
| Bezez: Trench G | 2.91 | 0 | 27 | 44 | 21 | 4 |
| 30m. Beach | 2.07 | 14 | 48 | 33 | 4 | - |
| Modern Beach | 2.29 | 4 | 41 | 39 | 9 | - |
| Fluviatile pebbles, limestone, N.W. England | 2.00 | 20 | 48 | 28 | 4 | - |

Table G.1: Index of Flattening (for explanation see text, p.16).

## CHAPTER 3, SECTION I
## THE SOUNDINGS AT THE MUGHARET EL-BEZEZ
by Diana Kirkbride

Since I was largely in charge of the mechanics of the investigation, it has fallen to me to account for the stratigraphy of the several soundings. This description is, therefore, based on the following sources: Dr Dorothy Garrod's diary, made available only some time after her death; the writer's field notes; the notebooks of Dr James Skinner who was responsible for the investigation of the breccias and for the plans and surveying; and finally, Dr Ian Cornwall's notes on the analysed soil samples printed in full on pp.69-74.

The cave was sounded in a series of individual trenches and not in a single continuous one. Baulks were retained to provide both N-S sections and to facilitate the removal of debris. The dual nature of the project has already been explained (see Preface), and as both divisions were working simultaneously for at least half the time it was decided to establish the trenches north of a line through the centre of the narrow cave mouth, leaving the southern half free of passage. Trench K, a stratigraphical probe, was established along the bay just east of the cave mouth.

### SYSTEM OF IDENTIFICATION

All trenches were allotted a different letter at random. All stratigraphical layers were numbered, in a separate batch to each trench. The partial or entire removal of baulks is indicated by coupling the letters of the trenches concerned, e.g. G/D.
Trenches and numbers allotted:

| | | |
|---|---|---|
| Trial Trench K | Layers | No.1-20 |
| Trench D | Layers | No.250-259 |
| Trench G | Layers | No.30-55 |
| Trench S | Layers | No.99-108 |
| Trench M | Layers | No.147-158 |
| Trench V | Layers | No.200 |
| Cave V | Layers | No.197-199, 201-208. |

After the excavations Dr Garrod decided to differentiate still further the levels which actually contained Palaeolithic industries, by means of letters. The three Main Levels thus distinguished are:

Level A. Upper Palaeolithic: Aurignacian
Layers D.252
G.40, 42, 43

Level B. Middle Palaeolithic: Levalloiso-Mousterian
Layers D.254
G.44 & G/D.44
M.147, 150, 151, 155, 156
V.200

Level C. Early Middle Palaeolithic: Acheuleo-Yabrudian
Layers D.255, 256, 257
G.48, 50 & G/D.48, 50

G/K.48
K.14
M.152, 157, 158

Trench S and Cave V were not included, as their contents were considered to be too mixed. Certain of the mixed Neolithic and Upper Palaeolithic material from the central fill was included in the present study (see Chapters 4 and 5). All artifacts are marked by trench and layer number only and not by main industry level.

## THE MAIN EXCAVATIONS (Figs.S.1 and S.2)

Four trenches were laid out down the north side of the central E-W axis of the cave. They stretched from the breccia sill (the Lartet breccia) in the area of the cave mouth, to the rock barrier at the east end forming the roof of Cave V. The change from Division I to Division II was not accomplished at the top of any specific layer, so our 'surface' is indicated by broken lines in the sections as simply showing the height of the cave deposit when we took over.

### TRENCH K
### 6.75 x 2m.; Layers 1-20 (Fig.S.3)

This was a small trial trench laid out along the southern bay, and leading into some modern pits and an old, ragged digging (known as the Robber's Hole) which attained a depth of 2.40m. below our datum of 16.35m. a.m.s.l. (above mean sea level).

At least 1.25m. of deposit has been removed from the cave when Division II was called in at a purely arbitrary point. The point of departure was the base of a ?Byzantine wall at about 16.10m. The layers from the top downwards were as follows:

K1 Brown earth with some stones on which rested remnants of a ?Byzantine wall.

K2 Mixed pottery levels.

K3 A thin yellow clay surface, forming a 'floor'.

K4 Brown earth containing some Heavy Neolithic flints, shading into:

K5 Mixed up brown earth with some flint and pottery, the upper part of an extensive stone fill.

K6 Recent pit containing some Heavy Neolithic, cutting layers 1-5.

K7 Modern pit, east end of trench. Soft black earth and boulders.

K8&9 Both refer to the large depression filled with rockfall: angular limestone chunks, mixed with soft earth which gave the impression of floors. However, the contents were a mixture of pottery, Heavy Neolithic, Upper Palaeolithic, animal bones of recent appearance, a lump of breccia from the wall and so on. The only archaeological observation worth recording is that Heavy Neolithic implements were found in the western part of the trench and Upper Palaeolithic artifacts rather east of centre.

K10 Near its western end, the large depression ended with a small dip resembling a hearth pit, filled with rock-fall.

K11 Soft earth, at the western metre only, running to and finishing at K10. Sterile deposit.

K12 Eastwards of K10 were brecciating layers, which were archaeologically mainly sterile. The uppermost, K12, produced 9 Levalloiso-Mousterian flakes, but also a sherd. As this layer was in contact with the stone-filled depression, the sherd probably derived from there. K12 ran to another lower and larger dip than K10, numbered K20.

K20 A large dip, separated from the main stone-filled depression by a thin black layer. Filled with stones, but archaeologically sterile.

K13 Below K12, c. 25cm. deep; semi-cemented greyish clayey deposit, archaeologically sterile, running from the base of K10, sloping down towards the east and interrupted by Dip K20.

K13a The base of K13 and upper part of K15, where the grey clay deposit took on a reddish tinge and contained more sand than clay. Dr. I. Cornwall* described it as probably of external origin, perhaps from the nearby beach outside the cave. A fine calcareous gravel among the red-brown silt and sand. No archaeological material was found in it. A similar deposit was later encountered in Trenches G and D.

K15 Semi-cemented, archaeologically sterile, reddish sandy silt (40-50cm. deep). As this layer approached the lower Dip K20, it turned longitudinally to a yellow silt, also interrupted by K20.

K16 A slightly calcareous yellow-red sand with a little more silt than usual and containing some phosphate. Cornwall considers it too clean for an occupation horizon: '...the phosphate may have infiltrated from an overlying occupation horizon. It seems to be natural beach deposit.'

K13-16 were all interrupted by the lower Dip K20. Eastwards, they reappeared fleetingly and in narrower layers.

K14 Under a ledge in the rock wall forming the south side of K and east of K20 was an isolated deposit of beach material consisting of deeply patinated, rounded flints with non-calcareous concretions, containing much phosphate fine sand and some flint débitage (Level C, Yabrudian). Two Yabrudian bifaces and some flakes came from this cemented pocket, which was within K16.

K17 Decayed limestone cave floor.

---

* See his notes, printed in full as an appendix to this chapter, from which this and other extracts in the description of the layers are taken.

## DESCRIPTION OF TRENCH K FROM THE BASE UPWARDS

Sounding K was hardly a success in respect of the sequence of industries. Four Yabrudian bifaces and a few flakes were all it produced in situ although the presence of Levalloiso-Mousterian and Upper Palaeolithic were attested, albeit out of context. Nevertheless the sounding did warn of subsidence inside the cave.

The rock floor of the large southern bay was found just below the trench surface and it descended abruptly until it merged with the cave floor. The latter also tilted so sharply down from south to north as to be almost diagonal. Further, the floor also sloped steeply down from west to east, falling a metre within the 6.75m. of the trench. Therefore such deposits as were in situ had been subjected to two tilting actions; a gradual one from west to east and a very strong one from south to north.

Level C. The beach deposit containing Yabrudian bifaces was present only in an isolated patch, caught and held in place by a slight overhang in the rock wall (Fig.S.8). The rest of the shingle had gone, drawn down by the formation of the large swallow-hole. On a level with the shingle were the red and yellow sands which, in other trenches, were superimposed upon it. The drawing action had been responsible for this longitudinal redistribution of layers. Above were the largely sterile layers K13 and 12. The latter should equate with the Level B Levalloiso-Mousterian over the rest of the cave, but the intrusive sherd makes the layer suspect. Above K12 came the main depression filled with rockfall and a mixture of artifacts from various periods.

## TRENCH D

8x2.50m.; Layers 250-259 (Plates S.5, 6; Figs.S.4, 5 and 6)

This trench extended from just outside the entrance eastwards to baulk G/D. As the main E-W section had to be in a straight line along the axis of the cave, D was narrower than the other trenches. The oblique run of the northern wall of the cave also accounted for a width of only 50cm. in the entrance itself (Plate S.6). Owing to the presence of extremely hard breccia deposits, only the easternmost 1.75m. from the baulk could be excavated to a certain extent, but further west the rock could not be reached. Also, the north section terminated against the curving rock wall about 1.50m. from the baulk. Layers from the top downwards were as follows:

D250 'Surface' layer: stony, with mixed fill including pottery.

D251 Clayey layers indicating that rain water had run down a slope. Archaeologically mainly sterile, but with a few sherds near top.

D252 Level A. Upper Palaeolithic. Fine, brown deposit, sterile in G/D, running from the stone-filled depression and appearing for a short stretch west of the clay levels D251. It sloped up towards the doorway, lensing out under a greyish-brown archaeologically sterile fill of powdery consistency probably blown in through the cave mouth.

D253 Grey-brown powdery fill superimposed upon the lensing-out Upper Palaeolithic D252.

D254 A dark layer below D252 sloping up towards the mouth and lensing out below D253. Level B. Levalloiso-Mousterian.

D255 In the cave mouth, just inside the sill, a tough sandy earth containing Yabrudian, Level C, which, slightly further west was overlain by the sill breccia. Some very large and archaic-looking implements were embodied in this layer, but no bones. Below it, just inside the sill area, was hard blackish breccia containing both bones and flint fragments. These were broken up together.

D255b Sloping steeply down towards the interior, the yellow sandy deposit gave place longitudinally to a less hard, grey-brown layer of a nutty or crumb-like consistency. The latter, described as 'slid material', thickened towards Baulk G/D. Archaeologically sterile for most of its length, this layer contained Yabrudian near the baulk and more above the smaller swallow-hole where the baulk was partially excavated. This layer rested on beach material.

D259 East end of Trench D. Beach of graded sands, thickening as it approached the second swallow-hole and comprising purple sand (red-black) above yellow to white sand lying on shingle.

D256 Trench D was then extended west, over the sill and through the entrance. Beyond a bulge of rock and conglomerate on the north side of the mouth was a red clayey deposit, partly cemented and containing plentiful Yabrudian as well as bones; the latter included two pieces of tusk. As elsewhere in this trench, the artifacts were very large and archaic-looking. In the centre of the trench at this point, particularly hard breccia containing many rounded pebbles was encountered. It was possible to break through over a limited area into a clay pocket which also contained faunal remains and Yabrudian implements. This deposit is not shown in the section, but lay below the level of the sill breccia.

D257 A cavity in the north side of the entrance formed by an overhang of the rock wall. Here an intensely hard breccia overlay soft, reddish-yellow clay. Yabrudian artifacts and faunal remains were found in both breccia and clay. This pocket, also not on the section, was c. 30cm. below the sill.

The door breccias were too hard to work, even with powerful pneumatic machines, but they seemed to overlie and seal softer clayey deposits containing archaic Yabrudian and animal bones. The rest of the trench was also strongly cemented and for this reason it was not possible to connect stratigraphically those clay deposits which we were able to sound.

The north side of the sill breccia was loosened by a heavy pneumatic machine, revealing, just inside the entrance on the south side of the trench, a fissure containing yellow clay. This was removed for a depth of c. 20cm. before further intensely hard material was encountered. A pneumatic drill was then inserted but bored only a single hole before seizing up. The drill reached stone of some kind, cave floor or boulder, at c. 1.25m. below the sill.

D258 An area of decayed rockfall, covering the central third of the trench, lying on and in the Yabrudian horizon, but also partly obliterating the Levalloiso-Mousterian of D254 and making its line difficult to follow.

DESCRIPTION OF TRENCH D FROM THE BASE UPWARDS

The wall breccias in situ on the south side of the cave mouth may indicate the original positions of the occupation horizons. Unfortunately, although the breccias were planned, no notes seem to have been made to identify which were sterile and which contained flints. Half the door breccias were sterile and the other half contained some nondescript flint fragments and small pieces of bone. Each part was about one metre thick. Dr Garrod identified the industry-bearing part as Levalloiso-Mousterian. The top of the sill breccia rested 25cm. below the base of the wall breccia, so it might be permissible to see in them the original deposition and perhaps thickness of the two earlier Palaeolithic deposits. The top of the sill breccia contained Yabrudian with hearth and faunal remains, the highest extant layer of that culture. Above, on the wall, lies the Levalloiso-Mousterian, with a sterile layer probably separating the two. The Yabrudian level thus lay between c. 15 and 16.50m. a.m.s.l. and the Levalloiso-Mousterian c. 17-18m. a.m.s.l. Dr I. Cornwall thought it also highly probable that the top of the Yabrudian breccia at the sill was originally somewhat higher and has been levelled off to make a flat entrance to the cave. This most likely took place during the Byzantine period, when a large lime kiln and various pavements and walled enclosures were erected inside, probably in connection with building Ornithopolis. Originally the Yabrudian sill breccia may well have reached the base of the wall breccia 25cm. higher.

From the way the levels slope up towards the mouth and break off, lensing out, it seems that they were drawn down from a point somewhere near the present entrance when the swallow-holes formed. However the sill breccia, when broken, revealed in section a black line showing the same tilt up to the west. The gradient in D is about 1.25m. in 4m. The real disturbance in the levels resulted from the formation of the large swallow-hole, the smaller one causing nothing more serious than a certain amount of slumping and accumulation, the base still holding above the presumed lower cavern.

At the east end of the trench, the slid material comprises beach shingle overlain by graded sands, first white-yellow and above that purple (red-black) which probably equates with K15. The Yabrudian layers lay immediately on this purple sand. At the west end of the trench, just inside the sill, was a hard, brown-yellow, sandy deposit described by Garrod as 'rubbly'. It lay above hard breccia (Bbh). Decayed rockfall obscured the layers for the middle third of the trench. East of the fall lay the grey sterile layer, with some Yabrudian in the baulk area, and westwards of the fall the yellow, sandy, rubbly deposit rose to and lensed out at the breccia sill. Although on the same level longitudinally, the grey and yellow levels are not of the same sediments.

Immediately above the Yabrudian, with no apparent intervening sterile layer, was the solid, dark Levalloiso-Mousterian level full of occupation debris, but without faunal remains. Owing to the rockfall, this layer was poorly defined. The adjacent Upper Palaeolithic deposit occurred only over a short distance, rising steeply before lensing out near Baulk G/D.

TRENCH G

4x3m.; Layers 30-55 (Plates S.5, 7, 8, 9; Figs.S.7-10)

This trench was later extended by 3.50x2m. towards Trench D to include part of Baulk G/D. A cut was made through Baulk G/K, 2x1.75m., and a small sounding 1.0m. long was taken up to the north cave wall to complete the N-S section.

The large stone-filled depression occupied Trench G except for about a metre along the northern side. Running straight and about 1.00m. in depth right along the E-W axis, it dropped to a depth of 2.50m. in the eastern metre.

Layers 30, 31, 33, 35, 36 and 38 all comprise different parts of this stone fill which, as in Trench K, contained Heavy Neolithic and Upper Palaeolithic artifacts. Along the northern metre of the trench were short stretches of layers sloping down to the south, ending at the subsidence. The contents were more prolific in the east and centre of the trench than elsewhere. The layers, from the top downwards, were as follows:

G32 Earthy brown layer containing pottery.

G35 Fine dark layers with Heavy Neolithic and some sherds.

G37 Fine brown layer with Heavy Neolithic.

G40 A small sounding along the east side of the trench, 1.00m. wide, made to clarify the junction of the Neolithic and Upper Palaeolithic layers; it revealed layers G41-G45. Some Upper Palaeolithic corresponding to G42.

G41 Dark occupation debris. Base of Neolithic level.

G42 Brownish layer with some decayed rock boulders, containing Upper Palaeolithic (Level A).

G43 Black layer, base of Upper Palaeolithic as in G42, containing silt with much organic material and crushed charcoal.

Note: G43-34 ran from the north section of the trench as far as the stone-filled subsidence where they appeared to continue, but the looseness and softness of the fill made it impossible to excavate stratigraphically. All layers dipped towards the south.

G44 Described by Dr Cornwall as 'fine, dark, greyish humic soil with organic matter, some charcoal and phosphate, with hard cemented earth in some places and streaked with thin, black discontinual layers'. Containing Levalloiso-Mousterian (Level B), this layer had slumped, but without causing important internal disturbance. Owing to the fanning out effect caused by the subsidence, the thickness of this layer ran from c. 5cm. at the north to one metre near the depression.

G46 Hard, grey layer, archaeologically sterile; perhaps equivalent to D255b.

G47 Hard, reddish-brown layer shading into G48 in its lower part.

G48 Level C. Yabrudian occupation layer. Hard red-grey sandy layer of nutty or crumblike consistency, cf. D255b, containing abundant Yabrudian, but no faunal material. Essentially the same as G47, except not quite so cemented, and with occupation debris. It was described by Cornwall as 'non-calcareous grey-brown soil with clay lumps and white patinated débitage together with some angular vein-quartzes. The soil crumbs are medium sandy in grade. Plenty of organic matter present, some iron, but very little charcoal. It is essentially beach sand mixed with the usual dark organic matter and occupation debris.'

G50 A black, somewhat sticky layer, more evident in the centre of the trench than at the sides, also containg Yabrudian, but no bones. G50 shaded into G50a.

G51 Towards the north side, some Yabrudian artifacts rested on yellow-red sand as well as in the darker layers above.

G50a Described by Cornwall as purple, red-black, '...slightly loamy sand with humus and considerable iron, containing a few larger quartzes which are well-rounded and polished. It appears to be a beach sand of external origin without any important concentration of phosphate.' G50a probably equates with K13 and D255.

G52 Beach of graded sands comprising:

G53 Yellow sand.

G54 White sand.

G55 Beach shingle.

Along the centre of the trench, layers G44-55 lay below the base of the stone fill; they were cemented to varying degrees, the beach being specially hard.

DESCRIPTION OF TRENCH G FROM THE BASE UPWARDS

In the initial stages of the excavation, only the western edge of the large swallow-hole was revealed, with no hint of the presence of a second one. The floor of Trench G was composed of a narrow rock platform along the north side (Plate S.7) only 50cm. wide and 2.30m. long. This beach dropped vertically into the swallow-hole to the east, while along its south side it sloped gently for a few centimetres and then fell sharply into a steep and narrow gully in the rock floor running E-W. The latter ended abruptly at the edge of the swallow-hole. The top of this roughly horizontal rock bench surface was only c.90cm. below the 'surface layer on the north, while the base of the gully was 2.20m. below; a drop of 1.30m. The deposits had slumped and accumulated in the gully to a certain extent.

The red-black sand of probable external origin lay directly above the beach. The sea had retreated by this time; the

contemporary shore lay to the west of the cave, in a good position for the prevailing wind, probably the same then as now, to blow light sand through the entrance. In fact all the layers contained sand.

Although the Yabrudian was rich in artifacts, neither bone, shell nor charcoal was met with in this layer of trench G, despite the presence of a hearth, some 10cm. thick and very sandy, lying above the rock bench. A number of heat-fractured artifacts were found in its vicinity. This was the only hearth encountered, although the former presence of others may be inferred from burned flint and bone, and charcoal scraps, e.g. in the door breccias of Trench D.

At the east end of Trench G, the N-S section shows the Yabrudian levels dropping steeply with signs of spiralling. The E-W section along the main axis exhibits an even steeper, almost vertical drop at the east end of the gully, but there is no sign of disturbance. The layers seem to be petrified in position (Figs.S.8, S.9, S.10).

The Levalloiso-Mousterian horizon of G44 was separated from the Yabrudian of G48 by two sterile layers, the upper one grey and the lower one of the same make-up as G48 but without the organic material. These together were less than 30cm. thick, whereas in Trench K the equivalent layers were between 50 and 70cm. thick. The occupation level containing the Levalloiso-Mousterian material included much debris, with some charcoal and black streaks; there were many artifacts, but no faunal remains. Dorothy Garrod notes that the artifacts bore less patination than those of the Upper Palaeolithic lying above, which were patinated white.

The small amount of intact Upper Palaeolithic was contained in a grey-brown deposit, which, when analysed, proved to be very like the Levalloiso-Mousterian one but much more silty, with plentiful organic matter and comminuted charcoal. Decayed boulders were present, but no bones. The flints were patinated white, like those in the contemporary wall breccias. Dark layers sealed this horizon both above and below.

The eastern section shows clearly the intact levels as they descend into the swallow-hole, fanning out as they slipped. The proliferating layer numbers used for the stone fill indicate the faintly suggested presence of possible floors, always composed of soft and powdery earth, among the boulders. The Upper Palaeolithic, Heavy Neolithic and later levels could have continued to slope across part of the drop, but in practice it was not possible to excavate the stone fill stratigraphically as the contents were of too light material that just dropped through whenever disturbed. As in Trench K, a possible separation of the lowest portion of the subsidence from the rest by a layer of earth was noted.

In Trench G the Pleistocene occupation sequence of the cave and its correlation with the beach was complete; it could also be related to the Palaeolithic sequence as shown by the wall breccias. The latter was particularly clearly demonstrated by the breccias above Trench K. Slumping was evident in the deposits as well as contraction from the relevant stages as shown by the wall breccias.

Baulk G/K contained mostly archaeologically sterile breccia as well as the southern half of the subsidence. Below this breccia an uncemented dark, reddish earth contained Yabrudian implements, but no bones. Neither Levalloiso-Mousterian nor Upper Palaeolithic artifacts were recovered. The Yabrudian-bearing deposit rested on beach sand and from its base came a group of small, irregular flakes which Dr Garrod considered might be Tayacian.

BAULK D/G OR G/D (Plate S.5; Fig.S.7)

After the excavation of Trench D had indicated the probable presence of another swallow-hole, a small trench was dug westwards from G leaving a 60cm. baulk between the two trenches. The rock-filled subsidence continued along the centre, running straight and finishing above the west edge of the small swallow-hole. West of the stone fill the level which had contained Upper Palaeolithic in G42-43 reappeared, though it was sterile here, sloping up to the west, and lensing out in the loose fill of D253.

Below the stone fill, the Levallosio-Mousterian and Yabrudian levels together fell into the small swallow-hole. West of the swallow-hole, they rose very steeply to the rock floor at a higher level than in G, and then sloped up towards the door. The rock could be followed a short distance only into Trench D as the overlying beach was cemented too hard to break. The industry-bearing levels slumped, with an accumulation of implements at the bottom of the small swallow-hole, but the beach levels had cracked to some extent. As in G/K, another pocket of possible Tayacian was found at the base.

The correlations are:
G/D42 = G42 = D252: Upper Palaeolithic.
G/D44 = G44 = D254: Levalloiso-Mousterian.
D/G48 = G48/50 = D255,56,57 = G/K48: Yabrudian.

TRENCH S

4x3m., reduced to 3.50x3m. to prevent the stone fill from falling in; Layers 99-108 (Fig.S.1; Plates S.11, 12, 14)

Situated immediately below the large, open dissolution dome, Trench S covered the centre of the larger swallow-hole, which measured 7m. across. The layers from the top downwards were as follows:

S99 'Surface floor' and some stones above.

S100 The stone-filled depression. In this case the contents were removed as one, without attempting to find layers. The industries were sorted typologically.

S101 A greyish clayey layer north of the depression, containing some Heavy Neolithic.

S102 In the centre, below the stone fill. Soft brown cave earth with red and white precipitates. Subaerial, probably washed in through the open dome above.

S103 North side. Reddish level containing Upper Palaeolithic.

S104 Archaeologically sterile, reddish material.

S105 Reddish layer, lighter than S104, described by Dr Cornwall as including 'grey clay crumbs and fine quartz sand, possibly from a beach. To all intents and purposes identical with G44.' As in G44, this layer contained Levalloiso-Mousterian, but no faunal remains.

S106 Grey and rather sandy, archaeologically sterile.

S107 South side. Reddish, ?Levalloiso-Mousterian.

S108 Greyish, perhaps separating the Levalloiso-Mousterian from the Yabrudian. A few Yabrudian implements were found in Trench S, but all were treated as being out of context.

Work on Trench S was halted at a depth of 4.30 metres.

## DESCRIPTION OF TRENCH S

Being situated across the centre of the large swallow-hole, Trench S presented a great problem in stratigraphy, with the result that the Palaeolithic industries encountered were mixed in excavation. This was caused chiefly by the different angles of fall from each of the four sides, the fact that the east and west edges of the swallow-hole in Trenches M and G were too far away to be of use, and the homogeneous colour and texture of the deposits when only a short distance from the north and south sides.

The stratification numbers given above refer to those parts of the layers, chiefly on the north side, that were observable in situ before dipping into the hole. As in G, they tilted down to the south, but apart from that slope no layers could be determined, although in the SW corner the strata seemed to go down almost vertically, as they did in the SE corner of K. The centre of the trench also contained sub-aerial soils washed and blown in through the open roof, with phosphate derived from the upper levels. The floor subsidence must have occurred fairly gradually, making no undue disturbance in the sequence beyond signs of spiralling in the Yabrudian layers in Trench G, where such signs were confined to the north only. In Trench S, thin hard deposits, resembling calcrete floors, appeared to break off at the point of drop.

The centre of S was excavated first, with benches left around the sides to be removed separately later. Owing to the mixture of industries and our failure to reach any base, the trench was left temporarily, but, in the event, was never finished.

## TRENCH M

5x2.10m.; Layers 147-158 (Plates S.11, S.12; Fig.S.11)

This was the easternmost trench of the main sounding, backing against a rock ledge forming the floor of the NE Apse and also the roof of Cave V. This ledge had been quarried anciently. A small extension to the trench, 1x1.25m., running west, was dug to the east edge of the large swallow-hole. The Division I team had dug into the upper part of a Levalloiso-Mousterian deposit and thereafter Division II took sole charge. The layers from the top downwards were as follows:

M147 This lay west of the rock face. Dark earth with black lenses containing Levalloiso-Mousterian and some stones including beach pebbles, but no bones.

M148 Near the rock ledge, at the east end of the trench. Red-brown hardened earth. A disturbed layer, largely removed by Division I but containing some Levalloiso-Mousterian.

M149 Continuation downwards of 148. Also disturbed.

M150 In the centre of the trench. Sticky cave earth containing some decayed boulders, probably rock fall. Many Levalloiso-Mousterian artifacts. No bones preserved although Cornwall observed some '...microscopic red bone fragments and much organic matter and charcoal, burnt and unburnt clay crumbs, fine clay-encrusted quartz sand, but non-calcareous and not quite so ferruginous as G44 and 48'.

M151 Base of the Levalloiso-Mousterian level, but separated from M150 by a tough, thin, dark level.

M152 Yabrudian level immediately on and in beach shingle.

M153 Beach.

M154 Present in the east half of the trench only. Hard, semi-cemented level archaeologically sterile near top.

M155 Present in the east half of the trench only. Levalloiso-Mousterian industry with much faunal material preserved. This level lies immediately on the rock with neither Yabrudian nor beach below. The soil composition was similar to M150, but here it was calcareous throughout with plenty of humus, clay crumbs and quartz sand.

M156-158 Westerly extension of M150-153 inclusive, to the east edge of the swallow-hole, south end only (XV-XVI on plan, divided into M157 (dark layer on beach) and M158 (the beach).

DESCRIPTION OF TRENCH M FROM THE BASE UPWARDS

The rock floor of M, lying at c.15m. a.m.s.l. in the centre, was somewhat humped in section. Rising from the rock ledge towards the west, a flat platform occupied the centre of the trench, the floor then descended again in a steepening slope to the swallow-hole. In the extreme NE corner the rock falls again towards the cave wall. The beach was without the thick deposit of overlying graded sands characteristic of G. It was composed of large pebbles stained a greenish yellow, with the remnants of the graded sands adhering to them. These heavily cemented sands, as in G, were pure white, yellow and brownish. The beach did not extend the whole length of the trench; it terminated at the eastern edge of the flat, central part of the rock floor. From that point to the rock ledge there was no beach. Westwards, along the flat part and drop to the swallow hole, the Yabrudian levels lay directly on and in it. Neither shells nor bones survived in either the Yabrudian or the beach levels.

Above the Yabrudian lay the thick, dark deposit full of occupation debris and analytically closely akin to the

corresponding deposits in G, G/D and D, containing abundant Levalloiso-Mousterian. In Trench M the Levalloiso-Mousterian lay directly on the Yabrudian with no traceable intervening sterile level. The whole deposit was solidly cemented, from the east end of the horizontal part of the floor to the edge of the swallow-hole. The nature of the deposits in this part of the trench was non-calcareous, a factor that presumably accounts for the non-preservation of bones and shell. On the other hand, the eastern half of the trench contained prolific faunal remains, including part of a tortoise carapace. In this area the soil was calcareous, a factor that draws attention towards the nature of the water dripping from fissures and through the open dome. In the whole excavation, faunal remains associated with Palaeolithic artifacts were found only at the extreme east end and in the present entrance at the west, as well as in the wall breccias. The acid nature of the water dripping over the rest of the cave must account for the dissolution of all bone and shell up to the final easternmost two metres, where the change is dramatic: the dividing line seems to come at the end of the range of dripping from the dissolution dome and it is clear and abrupt.

In Trench M the Levalloiso-Mousterian may be preserved to something like its original thickness as suggested by the doorway breccias. Ancient quarrying and the work of Division I had disturbed its upper layers, but the main deposit was unchanged.

We found no Upper Palaeolithic in M, and none had been reported by Division I. However, as Dr Garrod's team was too small to keep a watching brief on the former's baskets the presence or absence of this horizon cannot definitely be ascertained.

## MINOR OPERATIONS

### TRENCH V. 3x1.50m.; Layer 200 (Plate S.14)

This trench was situated in the SE Apse, across the rock ledge forming the end of the high floor of the NE Apse, where a deep overhang in the side was visible. Little daylight reached this place, and excavation had to be carried out by the light of a pressure lamp. The one layer present may be described as follows:

V200 Soft cave earth, dark, with a line of decayed boulders about 30cm. below the surface. There was no apparent change in colour, but the deposit was softer near the base. Rock floor about 80cm. below the surface. Levalloiso-Mousterian, with more implements near the top than in the lower half. Faunal material, including a coprolite, was preserved, but was not so prolific as in Trench M.

The rock floor at the base of Trench V led directly into a low tunnel-like cavern, Cave V, the opening to which was revealed below the overhang. In Trench V the floor was a little higher than in the east end of Trench M; 14.85m. a.m.s.l. in V and 14.61m. a.m.s.l. in eastern M.

## CAVE V

### Layers 197-199, 201-208 (Plate S.13)

This lies under the NE Apse, its roof forming the floor of the latter in the main cave: it is a cavelet with two branches, which were excavated from the entrance inwards. The layers were as follows:

V197 Very hard breccia, adhering to the roof and above the doorway, containing bones, implements and stalagmite. Levalloiso-Mousterian.

V198 Semi-breccia near the rock faces at a lower level than 197. Apparently disturbed: the whole area had been dug over by animals. Levalloiso-Mousterian.

V199 Very soft and powdery, constituting the main fill; fox-holes under, over and through the whole, as in 198. Entirely mixed contents: pottery, glass, Heavy Neolithic, Levalloiso-Mousterian, and a few pieces of Upper Palaeolithic and Yabrudian, together with modern animal bones.

V201 This was a number allotted to the mixed bag from the above levels. The finds were assembled for later typological sorting.

V202 Semi-hard deposit in the inner tunnels. Much Heavy Neolithic, and some Levalloiso-Mousterian.

V203 Soft, powdery red on the rock floor containing Levalloiso-Mousterian. This layer ran below hard breccia adhering to the east wall.

V204 Inner, east tunnel. Breccia of the east wall, full of Levalloiso-Mousterian flints. Probably equates with V197.

V205 East tunnel. Soft earth in the centre, as 202, but softer.

V206 A long crack in the rock inside and to the left of the entrance, full of reddish earth, very soft.

V207 Soft red earth in the east tunnel near floor, also present in holes and depressions in the rock floor, as V203.

V208 East tunnel, sloping up at north end, breaking through into the NE Apse of the main cave. A narrow hole in the floor of the apse gave access for a thin person to Cave V from the main cave. The tunnel had a soft upper fill at the extreme end.

### DESCRIPTION OF CAVE V

Cave V was very low and completely cut off from light (Plate S.13). The deposit was very soft in parts, principally near the floor and at the ends of the tunnels. Very hard breccia occurred near the roof at the entrance, and part of the way down the east wall only, but the soft fill ran below the breccia at the wall bases. In places, the cavelet was not filled to the roof. The contents appeared to be mostly Levalloiso-Mousterian, but there were also many Heavy Neolithic implements; faunal material was also preserved. The main contents of the soft fills were predominantly Levalloiso-Mousterian, but serious mixing had been caused by

burrowing animals. Evidence for the presence of these animals had been encountered in the Division I excavations in the main cave, where burrows and holes were visible from a point below the large dissolution dome stretching back towards the east end of the cave. The animals must have entered Cave V through the hole in its roof, as no traces of burrowing were encountered in Trench V, which covered the whole cavelet entrance.

It is difficult to account for the great amount of implements, bones and so on found in Cave V other than by suggesting that it had been used as some form of habitation. It may have served as an inner refuge in times of stress, affording greater safety than the large, main cave. As the Levalloiso-Mousterian deposits in Trench V totally covered the doorway, it seems possible that the cavelet was used during the early part of their occupation only and was rediscovered through the small roof entrance in the NE Apse, perhaps by children, who used it as a playground at intervals thereafter. Some such explanation could account for the presence of a few Upper Palaeolithic flints and even for the considerable number of Neolithic ones. Burrowing animals certainly brought down the glass and other modern fragments found in the soft earth, but it seems doubtful that they could account for all the other remains present.

THE ROBBER'S HOLE (Plate S.14)

It was intended to dig this old excavation as an extension to Trench K, but time did not permit. The rough trench showed the beach running at about 15m. a.m.s.l. at its east end. Earth had been burrowed out from below a deep overhang in the south wall of the cave in a sloping descent reaching about 2m. under the cave wall. Massive stalagmite was visible. A deposit of breccia on the wall just at the overhang contained Levalloiso-Mousterian artifacts and Cornwall also reports calcareous worm tubes and shells. Unfortunately, all efforts to find the sample of the latter that was taken at the time of our excavation have proved fruitless. It is not known to whom it was sent for identification of the marine worms.

CONCLUSIONS: THE ARCHAEOLOGICAL SEQUENCE AT MUGHARET EL-BEZEZ

Despite reports to the contrary, the Bezez main cave deposits were not seriously disturbed by the various contortions of the floor except in the large swallow-hole. Elsewhere they maintained their position in relation to each other, and corresponded to the evidence provided by the wall breccias. The latter reflected the original order of deposition of those strata with which continuity was lost when the large swallow-hole was formed. The levels have been elongated and consequently flattened and some, the lighter, sterile ones, seem to have disappeared completely in some cases. The layers tilt, fall and slump with a resulting thickening of the deposits lying in the bases of depressions. The only major disturbance is the longitudinal displacement visible in the sloping deposits of trenches K and D, and in the extreme thinness of the strata along the north side. Only at the north edge of the swallow-hole in G is any spiralling visible; any confusion of industries in

some layers was caused by the excavators' misjudgement of the angle of fall or thickness of accumulation, and not by disturbance.

The cave floor, on the other hand, seems nowhere undisturbed except in the apses and Trench M. Even in the latter, the suggestion of a further subsidence, or even of the existence of another cavelet below Cave V, cannot be ruled out. The eastward slope leading under the rock ledge and dipping towards the north cave wall suggests at least a deep overhang similar to the one in the Robber's Hole.

The tidy termination of the beach shingle in a N-S line roughly across the centre of Trench M also seems unlikely to reflect the original situation. The beach cannot have been cemented hard at the time of the Yabrudian occupation as artifacts were found in it as well as on its surface. Loose beach pebbles were also found in the overlying Levalloiso-Mousterian strata and could have derived from the lower level; if so, this would suggest that the beach was still unbrecciated at that time. On the other hand, since the contemporary beach was not far away from the cave entrance it is not necessary for loose pebbles to have come from the internal beach. Mousterian man could simply have carried them in.

The presence of artifacts on and in the shingle in M and K may represent a minor early occupation. But people using tools of Acheuleo-Yabrudian type certainly moved into Mugharet el-Bezez for a reasonably long stay after the sea had retreated long enough for a reddish sandy deposit, of external origin, to have accumulated above the graded beach sands that had been deposited inside the cave. Although the large swallow-hole has upset the evidence from the eastern end of the cave, that provided by the western half is somewhat better. The Acheuleo-Yabrudian occupants used the comparatively narrow tunnel of the cave's present mouth as a place for fires and probably also for their meals, the bone debris from which they scattered all over the floor. We cannot know the precise position of the contemporary cave entrance, but this constriction in the cave was probably longer in those days than now. Apart from the evidence provided by the charcoal and bone-bearing breccias in the present entrance, together with the faunal remains extant in the clay pockets, the only other evidence for specific activity lies in a hearth in Trench G, though in this case neither charcoal nor bones occurred around it: Within a range of three metres from this hearth three separate pockets of very small, irregular flakes were found at the base of the deposit. Both Dr Garrod and S. de St. Mathurin thought at first that these could have been Tayacian, but as L. Copeland suggests, they could equally well be minor items of débitage including biface trimming-flakes, such as are regularly found in Acheuleo-Yabrudian industries. It is highly probable that these pockets are not in place owing to the presence of two swallow-holes and a gully in their immediate vicinity.

During the Acheuleo-Yabrudian occupation, quite a heavy fall of roof occurred within the entrance tunnel and just east of it; a possible indication of the onset of a cold period. It is also possible that some slight slumping of the floor might have occurred at this time; nothing violent, but enough to make the inhabitants

feel uneasy. These factors might have caused the abandonment of the cave. The subsequent archaeological stage, Yabrudian with intercalated Amudian, is represented at Abri Zumoffen, less than 100 metres north of Mugharet el-Bezez, and the latter was itself unoccupied during this time.

After this long gap in occupation at Bezez, Levalloiso-Mousterian man moved in. The hiatus is clearly represented by sterile breccias on parts of the walls, but is less well documented in most of the trenches. The Mousterians occupied the cave for a long time, using it from the present doorway to its innermost eastern recesses. The deepest extant Mousterian deposits are about a metre thick, but were probably deeper originally. The whole of this cultural layer contains abundant occupation debris, with plentiful faunal remains in the calcareous deposits of the wall breccias, Trenches M and V, and Cave V. Some roof-fall boulders were found at the east end of the cave, but these seem more like individual blocks than a concentrated fall. In Trench V, running parallel with the entrance to Cave V, were a few small boulders, which are visible in Plate S.14, having been removed from the trench. Plenty of loose boulders must have been lying around, although few were actually encountered in the Levalloiso-Mousterian deposits. The cave floor was presumably stable during the Levalloiso-Mousterian occupation, but perhaps once again climatic change allied to a further sinkage of the cave floor caused it to be deserted for a further long period, until reoccupied in Upper Palaeolithic times by Aurignacian man.

From the clues provided by the wall breccias it is clear that the deposits inside the cave had reached a high level by this time; the Levalloiso-Mousterian and accompanying sterile level reached 18.35m. a.m.s.l., or 2m. above our datum at 16.35m., thus leaving an entrance passage only 1.50m. high on the south side of the present cave mouth. Within the cave the Upper Palaeolithic breccia, with sterile below, ranged from +1.00-1.75m. (c.17.35-18.10m. a.m.s.l.) in the vicinity of Trench K and the Robber's Hole, and from +2.50-4.00m. (c.18.85-20.35m. a.m.s.l.) inside the southern bay. Apart from the east end of the cave the southern bay had the only undisturbed floor, but it was the breccias that provided the sole traces of Palaeolithic habitation within this bay, and they were limited to Aurignacian.

The large swallow-hole must have developed very slowly, initially perhaps as a slight subsidence like the gully in Trench G, into which the strata eventually slumped. Though it is perhaps a facile interpretation, it has already been suggested that phases in the formation of the swallow-hole might correspond to the periods of abandonment.

The beach was probably slightly cemented by the time the process of development of the swallow-hole was far enough advanced to cause the strata to sink significantly. If at this stage the Yabrudians were still in residence they would doubtless have left, and the cave would have acquired a bad name. The slow enlargement of the subsidence would have been sufficient to draw the fossil beach and the Yabrudian strata away from the east wall of the cave, and thereby account for the suspiciously straight line, already

referred to, with which both terminate so abruptly and unsystematically across Trench M. This process must have been completed before the Levalloiso-Mousterian occupation, for the rock floor at the east end was already bare when the new people arrived.

The gradual slumping would have continued, probably to a stage not unlike that of the small swallow-hole where all the deposits are collected in a sack-like bulge hanging through a hole in the floor, but without breaking. When the Upper Palaeolithic (Aurignacian) occupation began there must already have been a definite hollow in the floor, which the inhabitants filled up with accumulated roof-fall debris. The Aurignacians seem to have lived in the western half of the cave rather than the extreme eastern half, where their presence is attested only by a few artifacts in Cave V. This could indicate a deep sag in the deposits under the dissolution dome, with the brecciated deposits still holding despite having no floor beneath them. The final collapse seems to have come after or during the Aurignacian occupation. The split took place across the N-S axis, causing spiralling in the not too strongly cemented strata along the north side as in G, and breaking into hard, thin, calcrete-like layers in S. Along the south side, the industry-bearing levels were almost entirely absent. From E-W, however, the strata seem to have stretched, bent and followed the retreating edge of the rock floor westwards without sign of a break and with the cementing process still active; in places they are petrified in almost vertical drops. There now remain only two metres, in the gully floor of Trench G, to dissolve before the two swallow-holes are united.

When Mugharet el-Bezez was again occupied during the Neolithic there must still have been large hollows in the floor needing to be filled in. The cave has been in more or less constant occupation ever since, with the Byzantines particularly active. The latter erected small rooms, made pavements and built a lime kiln below the open dome. The latter was almost complete and its presence has caused the Recent deposits to cover the Levalloiso-Mousterian breccias and also, except in the southern bay, those of the Upper Palaeolithic. The last occupants, a Beduin family owning two cows and a donkey, were evicted from their home in the southern bay at the beginning of the excavations.

Much work remains to be done at Mugharet el-Bezez to fill in the details within the broad outlines established by Dr Garrod's work. Almost half of the Palaeolithic deposits were left in situ for this purpose. Her aim in undertaking the three investigations in the Lebanon was not to make exhaustive excavations but, by means of soundings, to attempt a correlation between the archaeological sequence of the Palestine caves and the geochronological sequence of the Levantine beaches. In this she was successful. Her conclusions were that the Acheuleo-Yabrudian of Mugharet el-Bezez derived directly from her Final Acheulean of Tabun F, while the Amudian and Yabrudian of Abri Zumoffen accorded with Tabun E.

Fossil beach traces are to be found on the cliff above the Bezez. Situated at c.30m. a.m.s.l., the largest of these remnants lies slightly NE of the small hole in the hill surface which is the opening at the top of the cave's dissolution dome. Inside the cave,

the Acheuleo-Yabrudian lies, as we have seen, on a beach at c.15m. a.m.s.l. At Abri Zumoffen, just north of the Bezez, the Amudian is connected with a beach at c.13m., and this latter beach platform was also located by Dr Garrod in a sounding outside and to the West of the Bezez. Her work at Ras el-Kelb revealed Levalloiso-Mousterian on a further beach at 6m. above present sea level. On the basis of this marine sequence, Dr Garrod equated both the Acheuleo-Yabrudian of the Bezez and the Amudian with Yabrudian of Abri Zumoffen with successive stages in the retreat of the sea from the 15m. maximum of Tyrrhenian II (Riss-Würm in the Alpine sequence). The Amudian resting on the c.13m. beach at Zumoffen she equated with the beginning of Würm, while the beach at 6m. above present level, with Levalloiso-Mousterian on it at Ras el-Kelb, she equated with Tyrrhenian III and the Würm I-II interstadial.

All these excavations were carried out before Sanlaville undertook his exhaustive researches into the Levantine raised beaches and the Palaeolithic remains equated with them. The nomenclature since given to the various oscillations of the sea-level were not known to Dr Garrod whose conclusions are summarised above in the terms in which she put them forward.

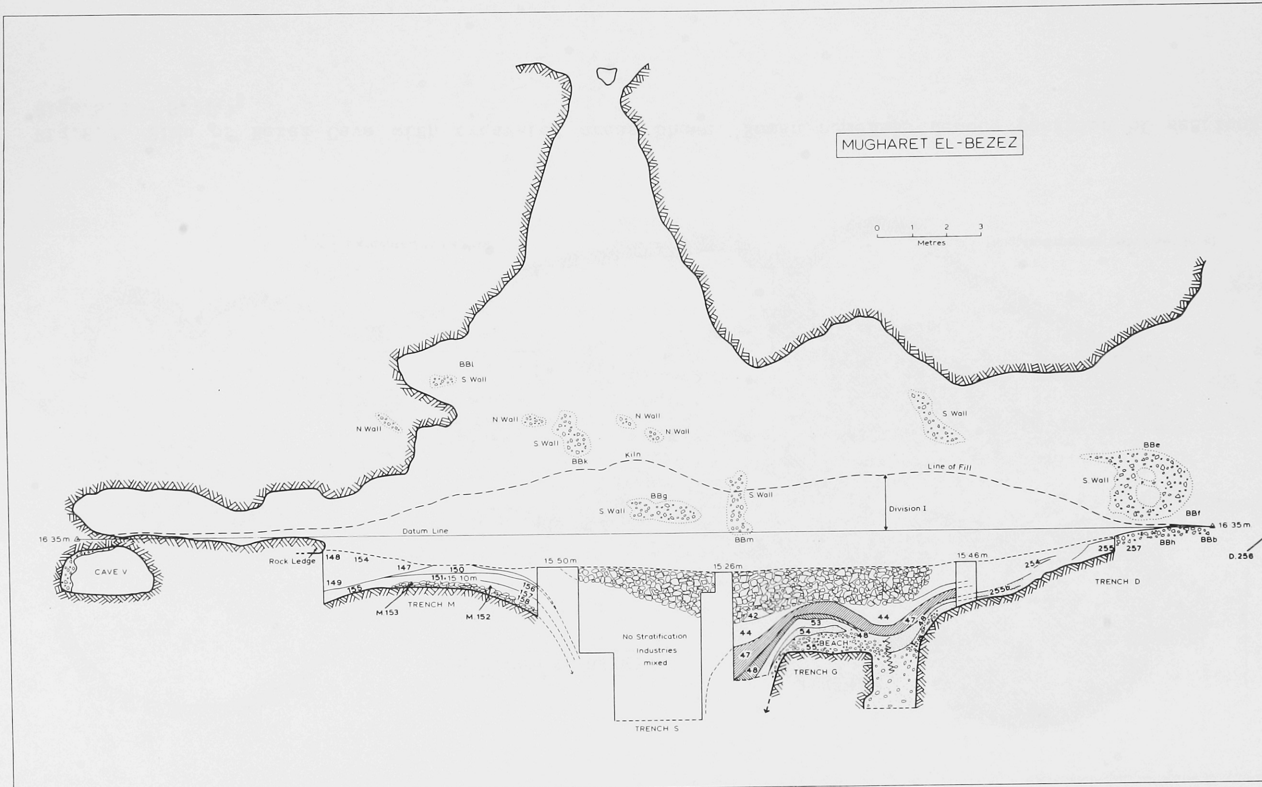



Fig.S.1. Complete section of the Mugharet el-Bezez, East to West, showing positions of the excavation units and the wall breccias described in the text.

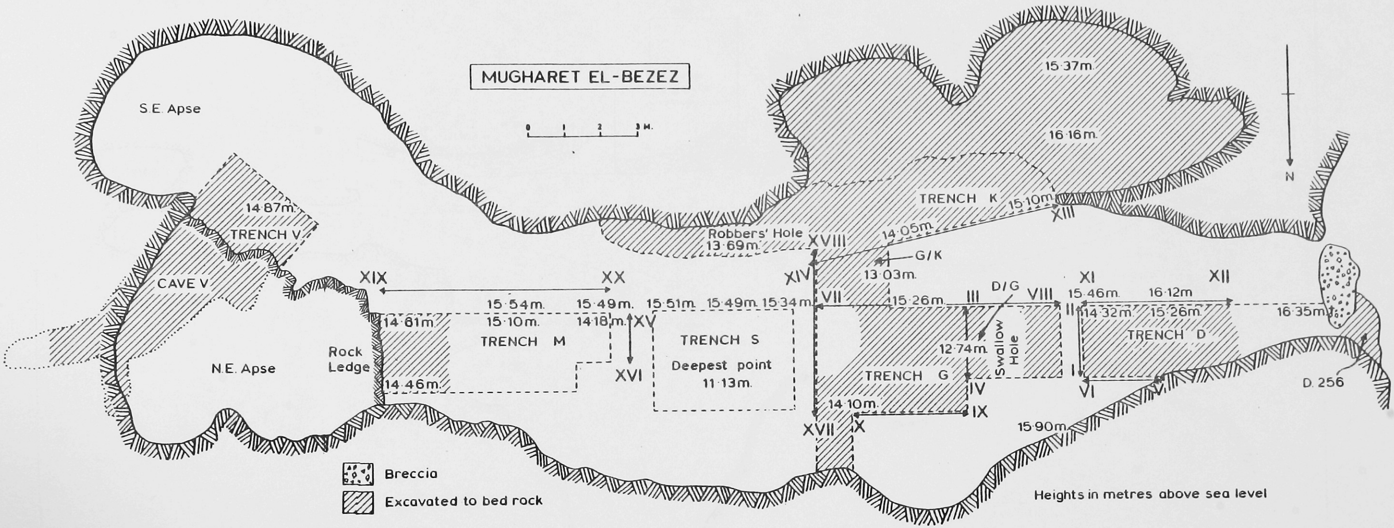



Fig.S.2. Plan of Bezez Cave with excavated areas shown. Roman numerals denote position of sections, Figs.S.3 - S.11.

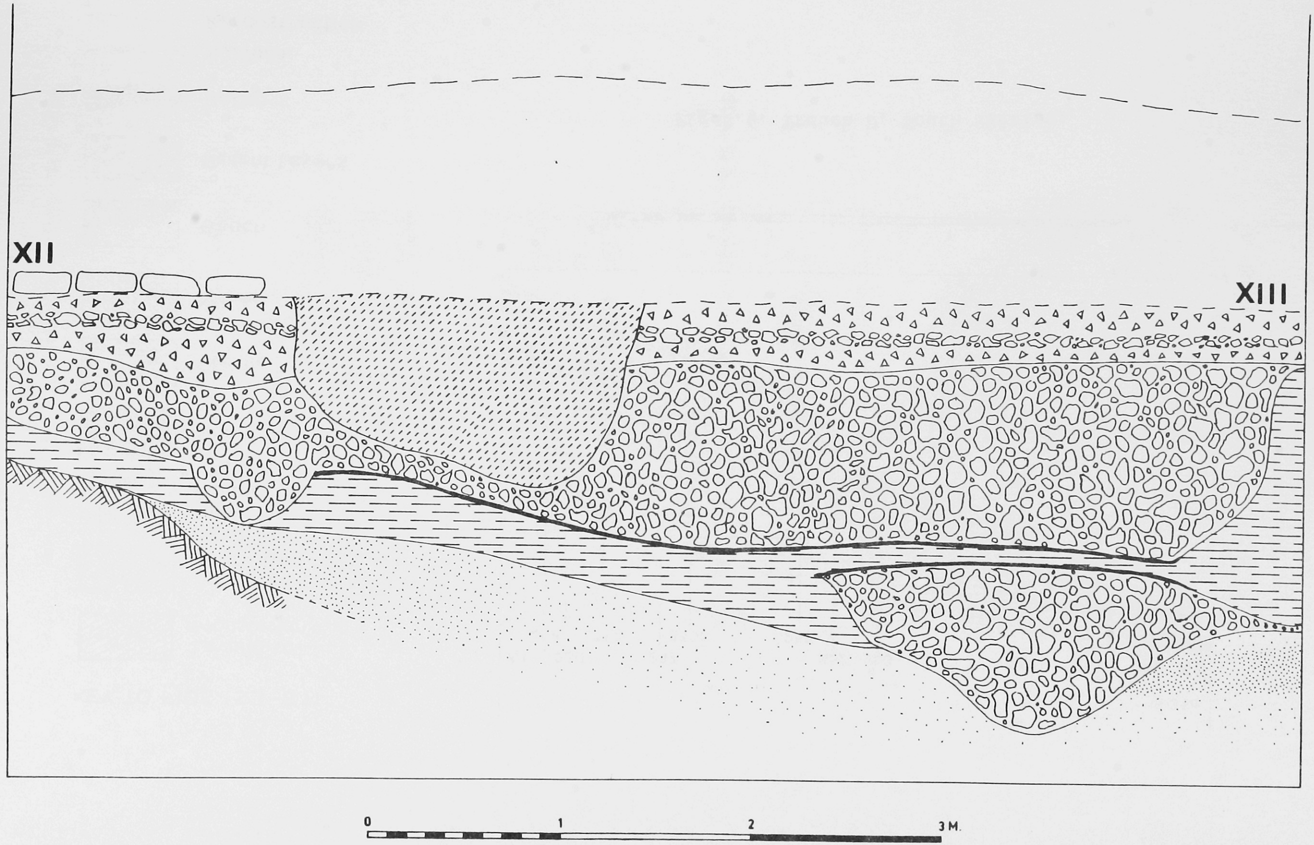



Fig.S.3. Trench K, North Section. The upper dashed line shows the approximate height of the fill removed by the Division I diggers. For key, see Fig.S.4.

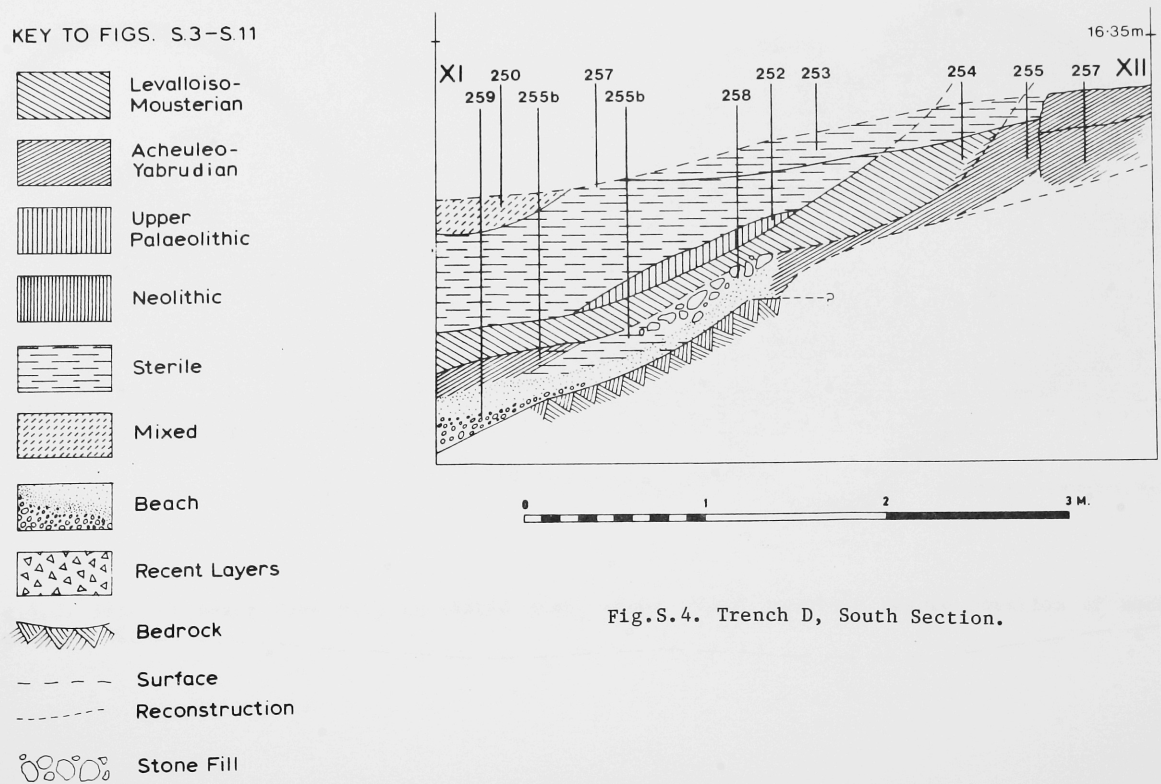



Fig.S.4. Trench D, South Section.

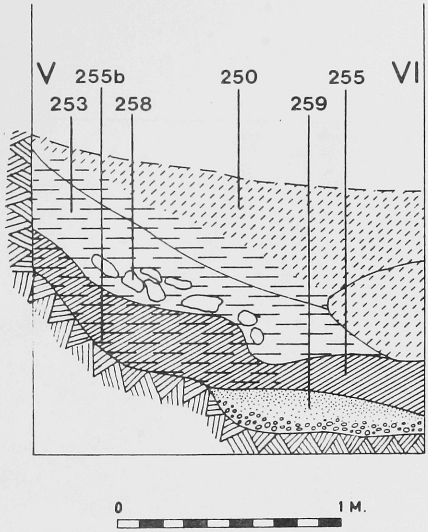



Fig. S. 5. Trench D, North Section. For key, see p.46.

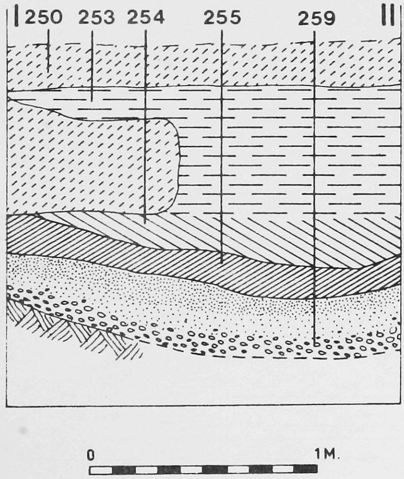



Fig. S. 6. Trench D, East Section. For key, see p.46.

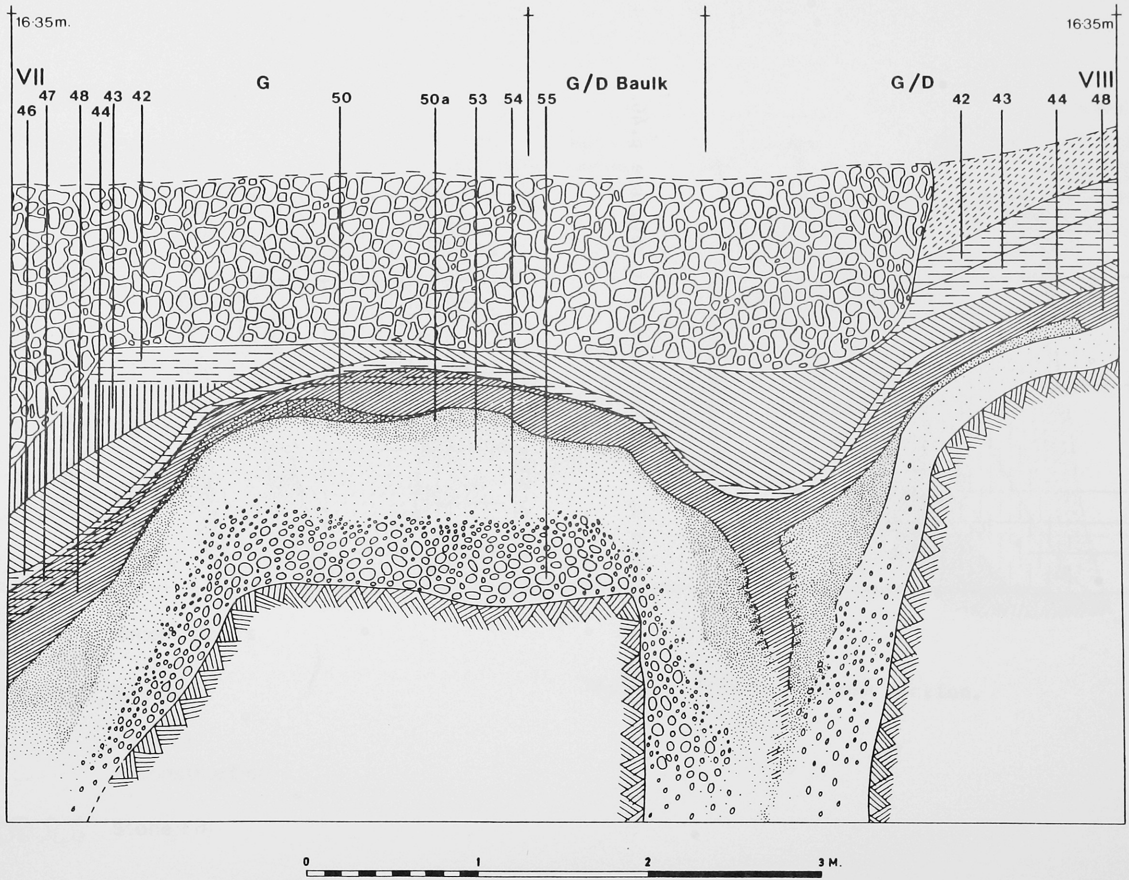



Fig.S.7. Trench G and Baulk G/D, South Section. For key, see p.46.

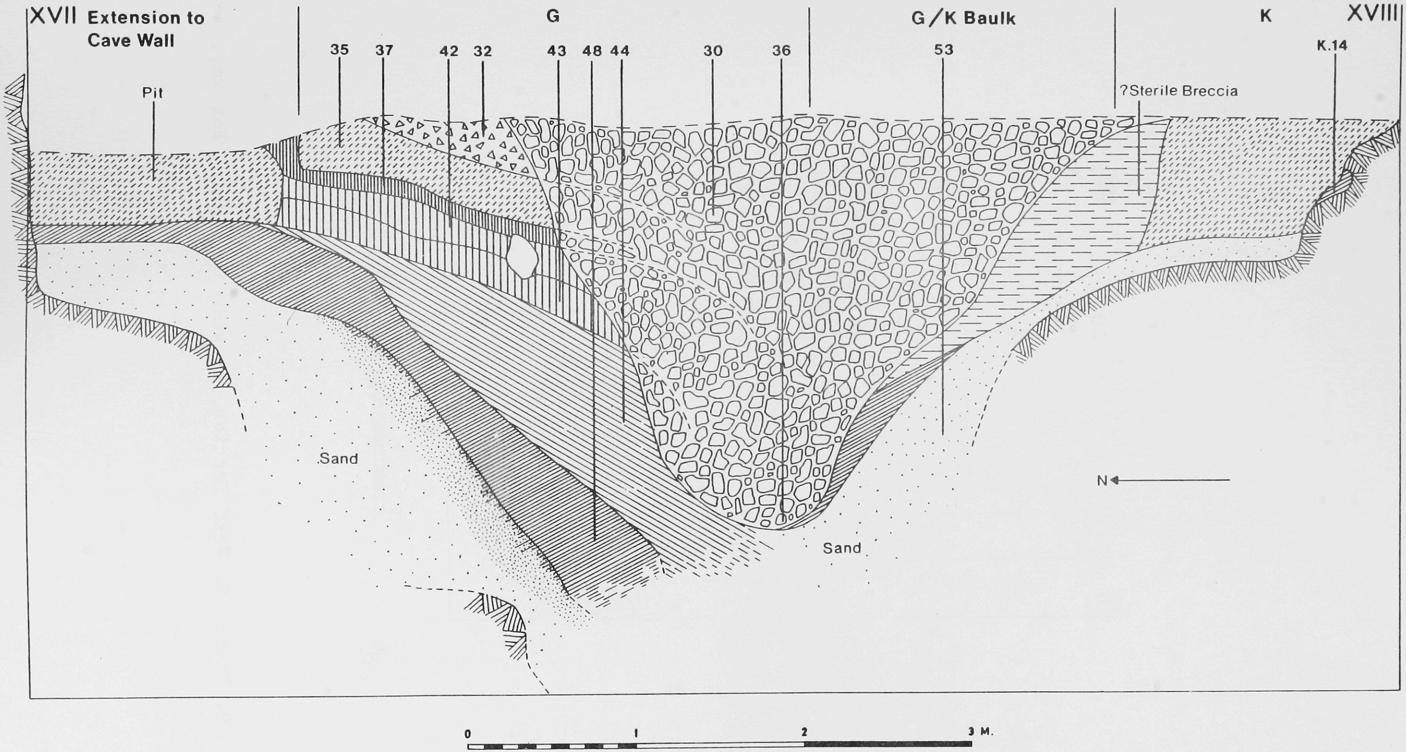



Fig.S.8. Trench G, East Section, also showing the extension cut to the north wall of the cave, the G/K baulk and the east section of Trench K. The south profile of Trench K has been projected 70cm. eastwards for the sake of showing in this figure the position of the Yabrudian 'pocket', K14. This has contracted the width of the east end of Trench K by about one metre (cf. Fig.S.2, which gives the plan of the excavated area). For key, see p.46.

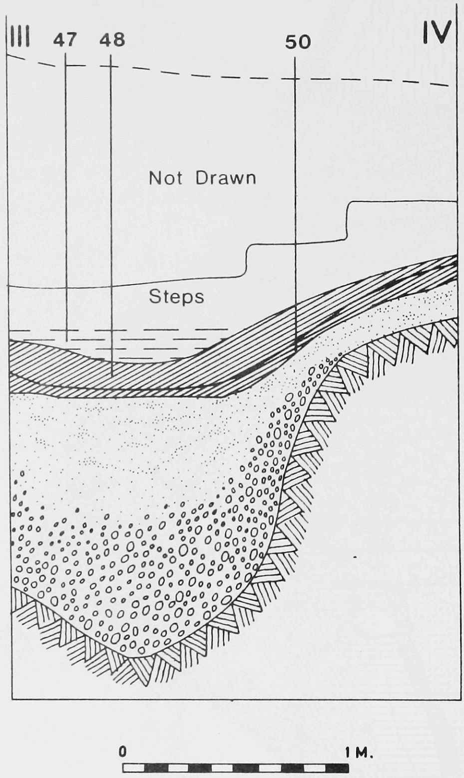



Fig.S.9. Trench G, West Section, showing the gully. For key, see p.46.

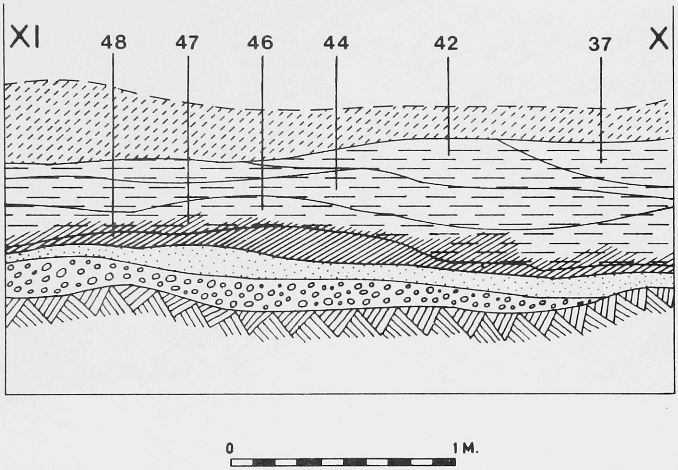



Fig. S. 10. Trench G, North Section. For key, see p.46.

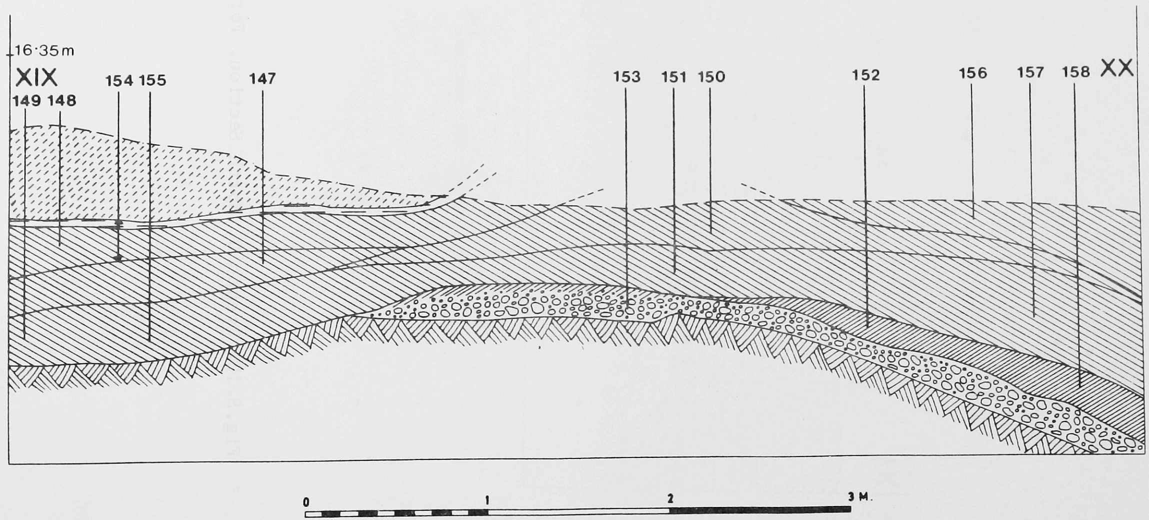



Fig.S.11. Trench M, South Section. For key, see p.46.



Plate S.1. The Adlun Promontory as seen from the west. Mugharet el-Bezez, right of centre (arrow) and Abri Zumoffen, left (cross). The houses are on the pre-Enfean terrace and the Enfean marine platform, sloping toward the sea, takes up the foreground. Quarry talus (below pylon) obscures the cliff between cave and shelter. The light area, upper left, marks recent quarry cuttings.



Plate S.2. From beside the High Cave, looking north-west: the platform on which the Byzantines built Ornithopolis. Background, the small bay, Minet Abu-Zebal. Between the caves and the sea are the road and railway going north to Sidon.




Plate S.3a. At left, the entrance to Mugharet el-Bezez (below the 'a'). The cliff shows remnants of other caves, and Byzantine tombs and cisterns. Centre, the High Cave (arrow) and talus below (b). Left background, the 150m.-high plateau.



Plate S.3b. Closer view of entrance to Mugharet el-Bezez from the west. Centre (cross), rock-cut steps up to the pre-Enfean terrace level. The High Cave can be seen at the extreme right (arrow).



Plate S.4. Entrance to the Mugharet el-Bezez. The marine platform (foreground) is here obscured by a built-up ramp as well as ruined rock-cut tombs.

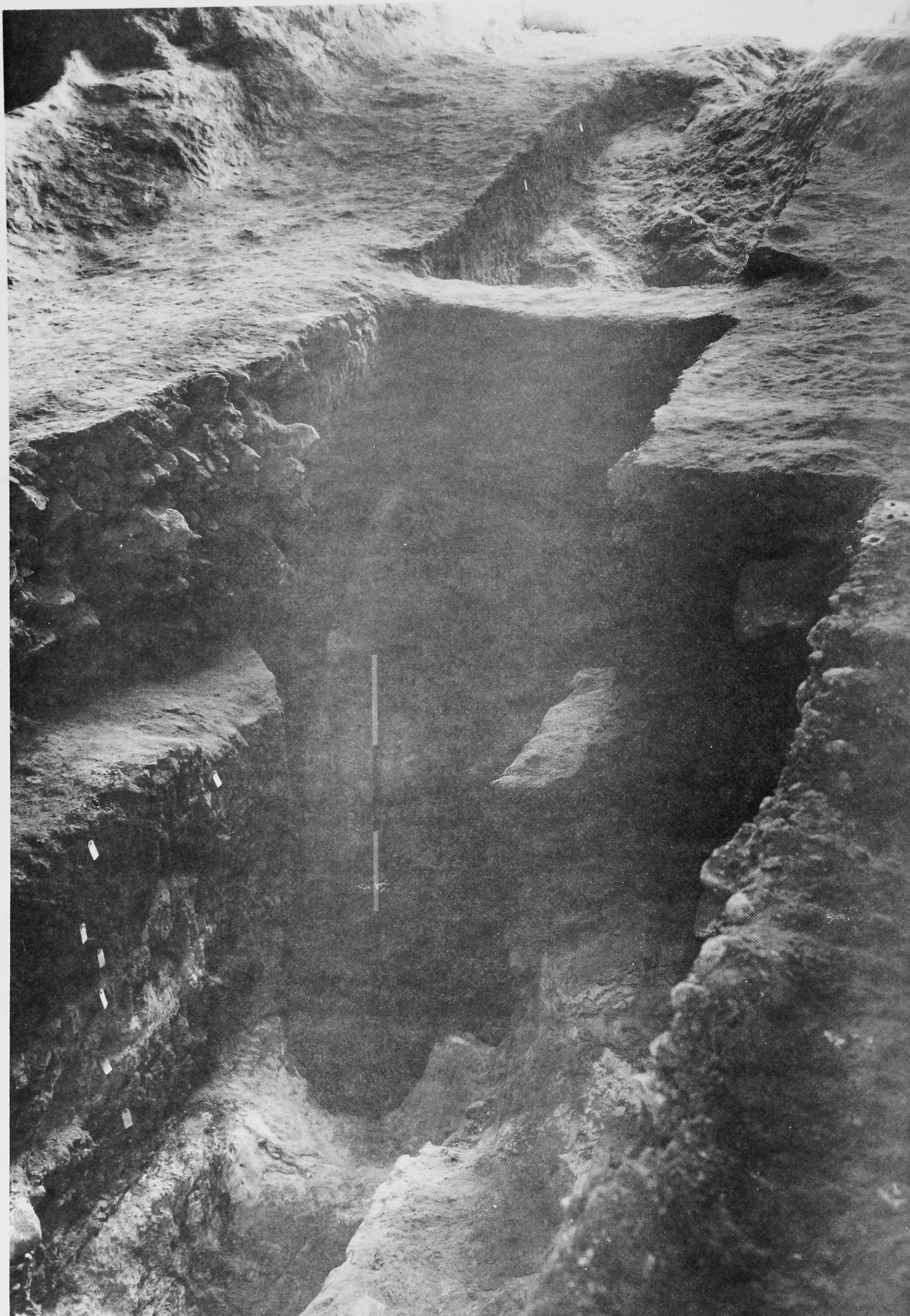


Plate S.5. Foreground, Trenches G and G/D, showing the gully in G and the small swallow-hole with part of Trench D in background. Photograph taken looking toward the entrance.



Plate S.6. Trench D outside the entrance, looking north; this view shows the position of D256 and D257 before excavation. Attempts to break an intensely hard breccia block are in progress.

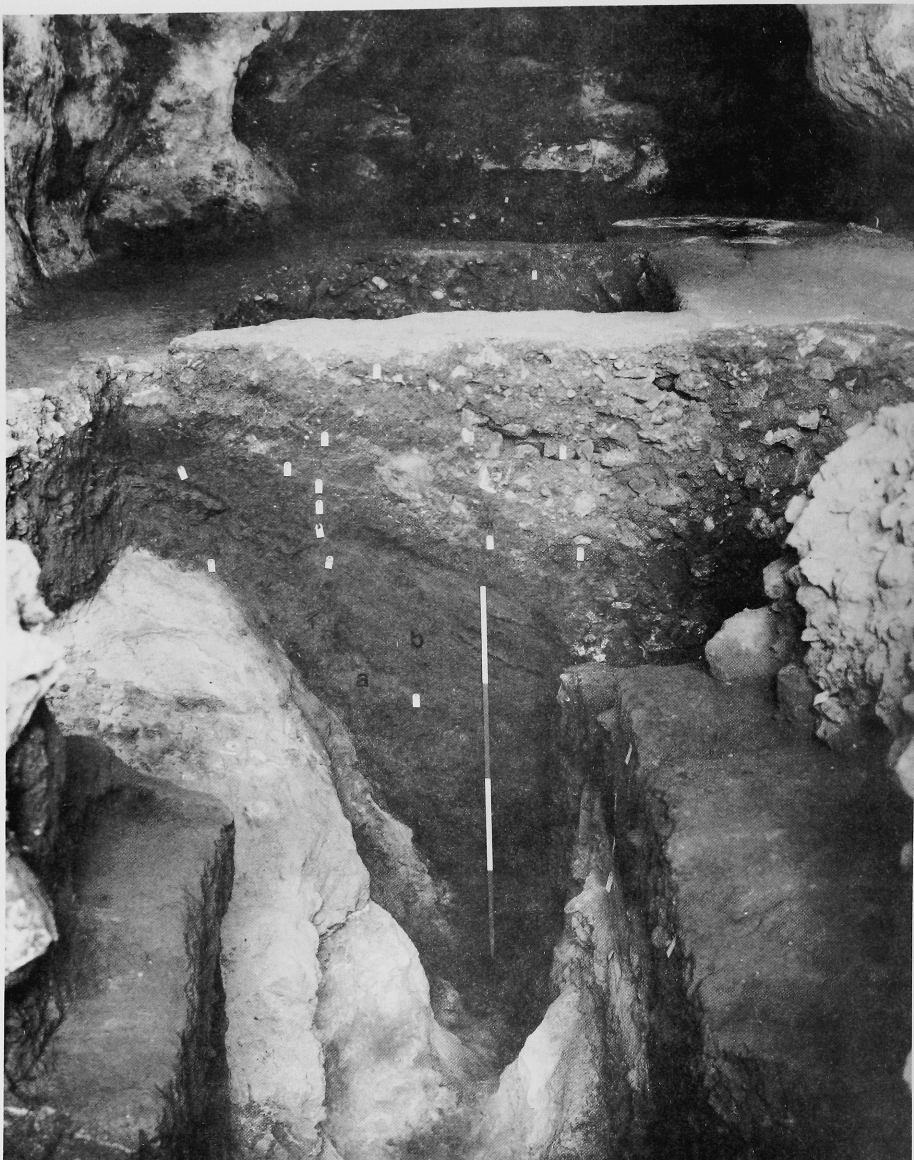



Plate S.7. Trench G, East Section. In contrast to the spiralling effect visible in the Yabrudian (a), the Levalloiso-Mousterian and upper layers appear to have slumped (b). Centre, the gully descending into the larger swallow-hole. Left, the rock shelf. Above the pole, the Neolithic fill can be seen. See also Fig.S.8.

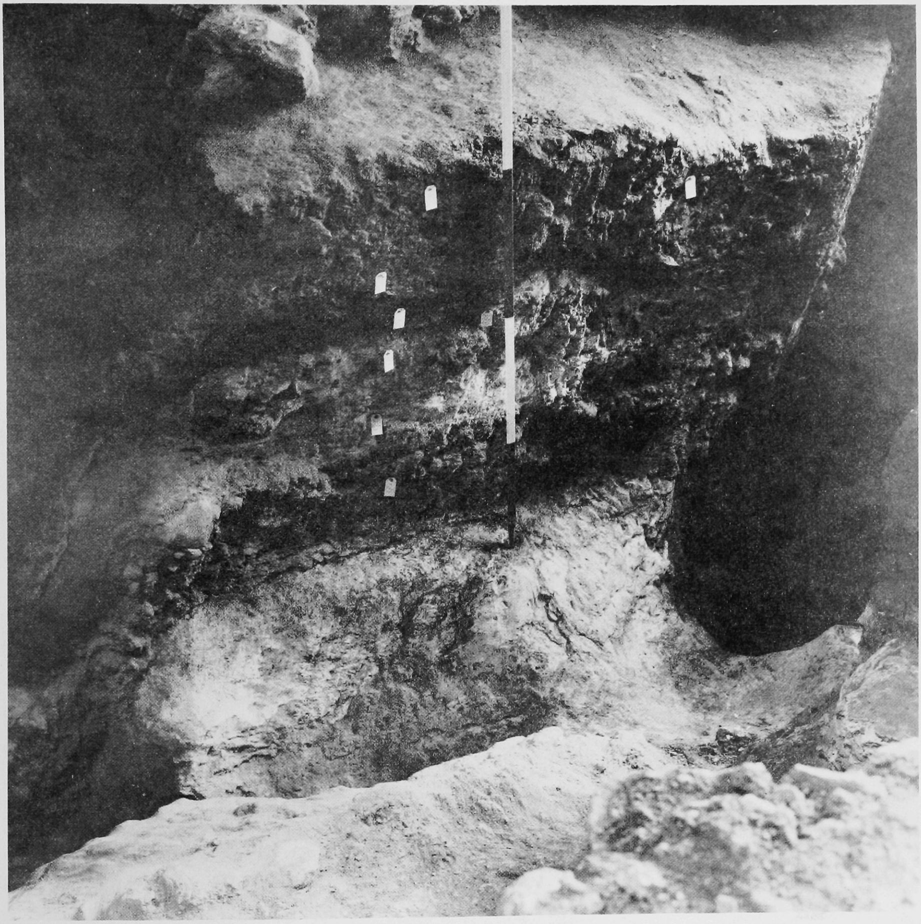


Plate S.8. Trench G, North Section, with gully and edges of the large swallow-hole, left, and smaller one, right.

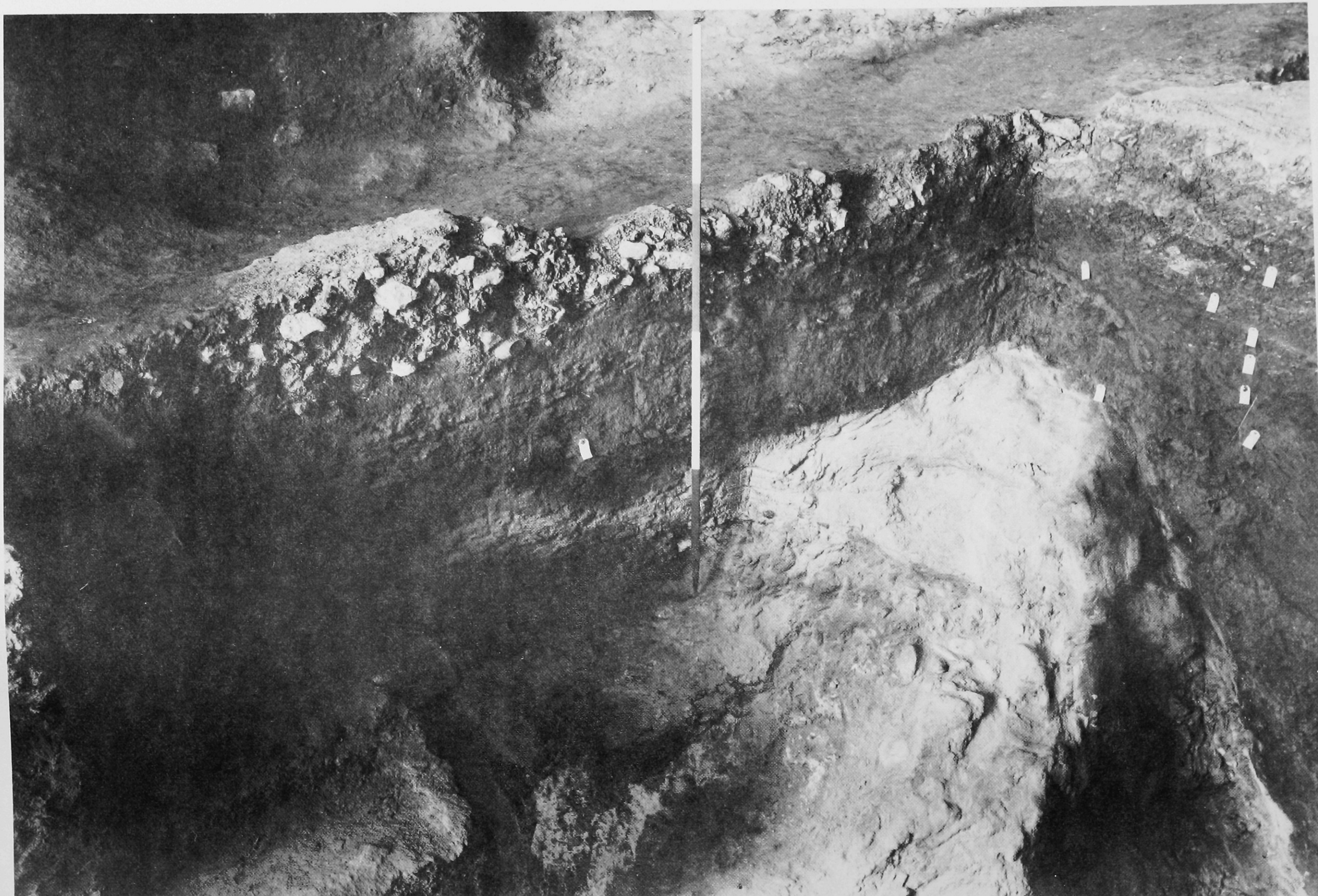


Plate S.9. North side of Trench G, with rock bench not fully excavated. See also Fig.S.10.

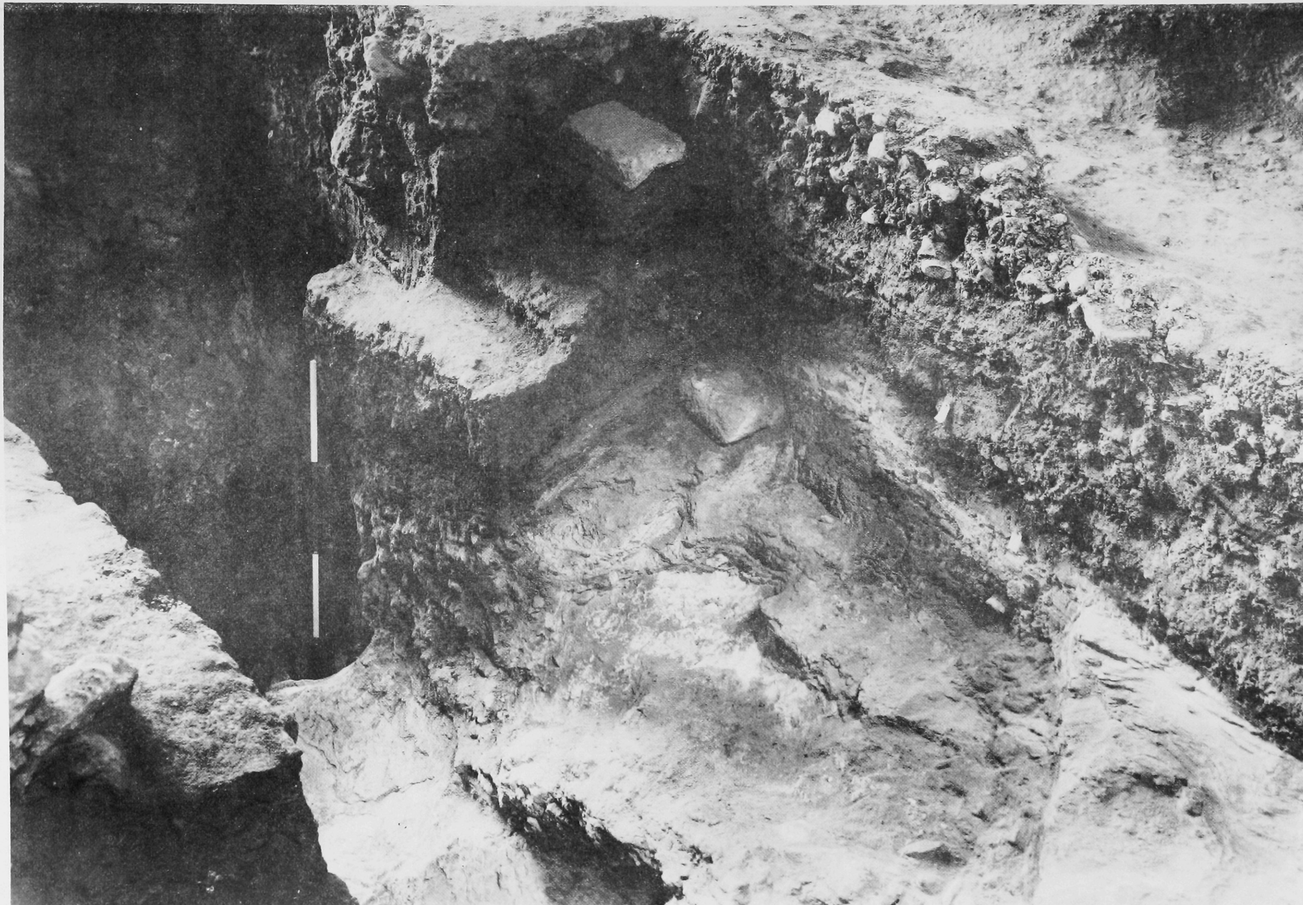


Plate S.10. North-west corner of G and G/D, showing gully floor and small swallow-hole. See also Figs.S.10 and S.9.

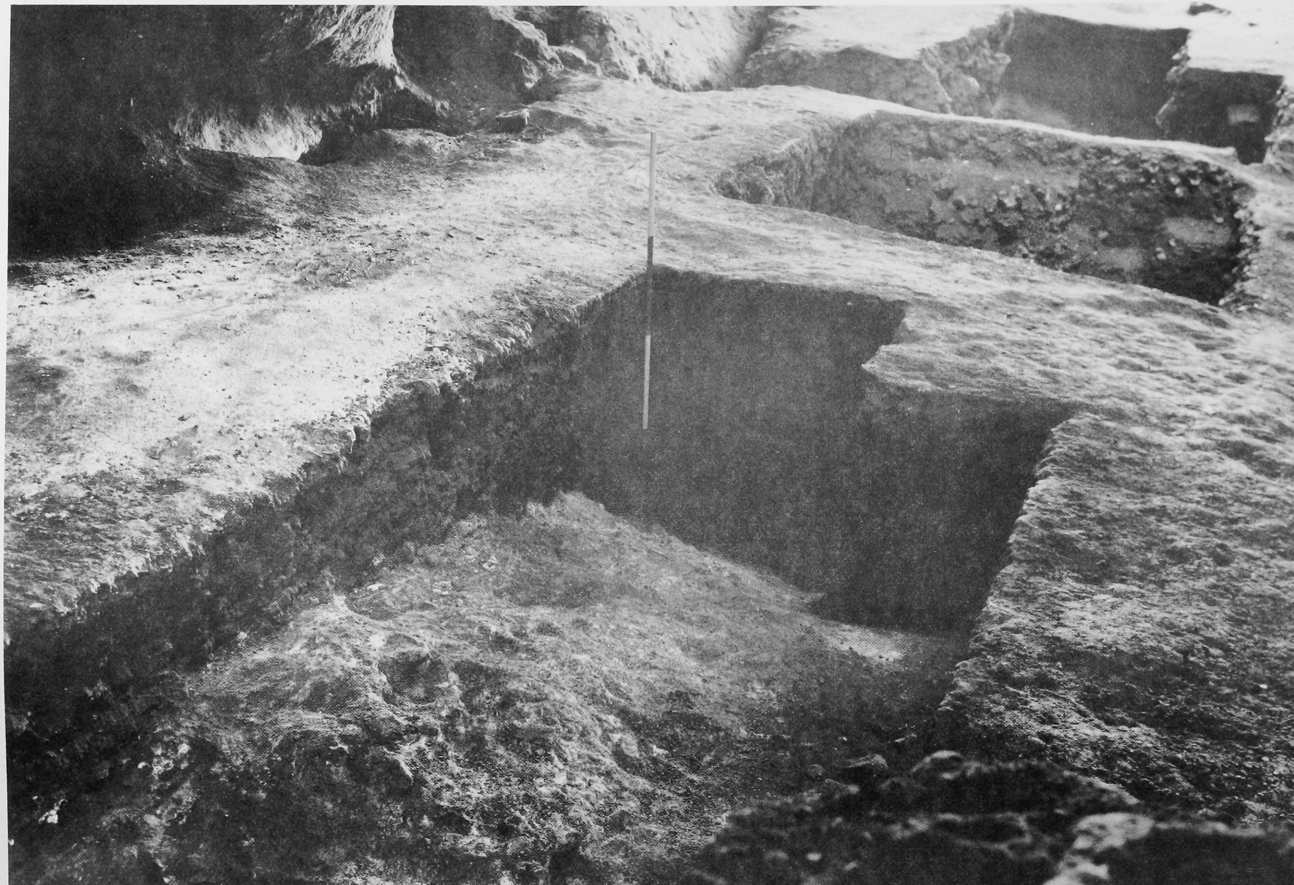


Plate S.11. Square M, looking west towards the entrance: the petrified beach, with Acheuleo-Yabrudian, and the westward slope to the large swallow-hole. In the middle background, Trench S which covered the centre of the hole. Trench G can be seen in the far background. See also Fig.S.11.

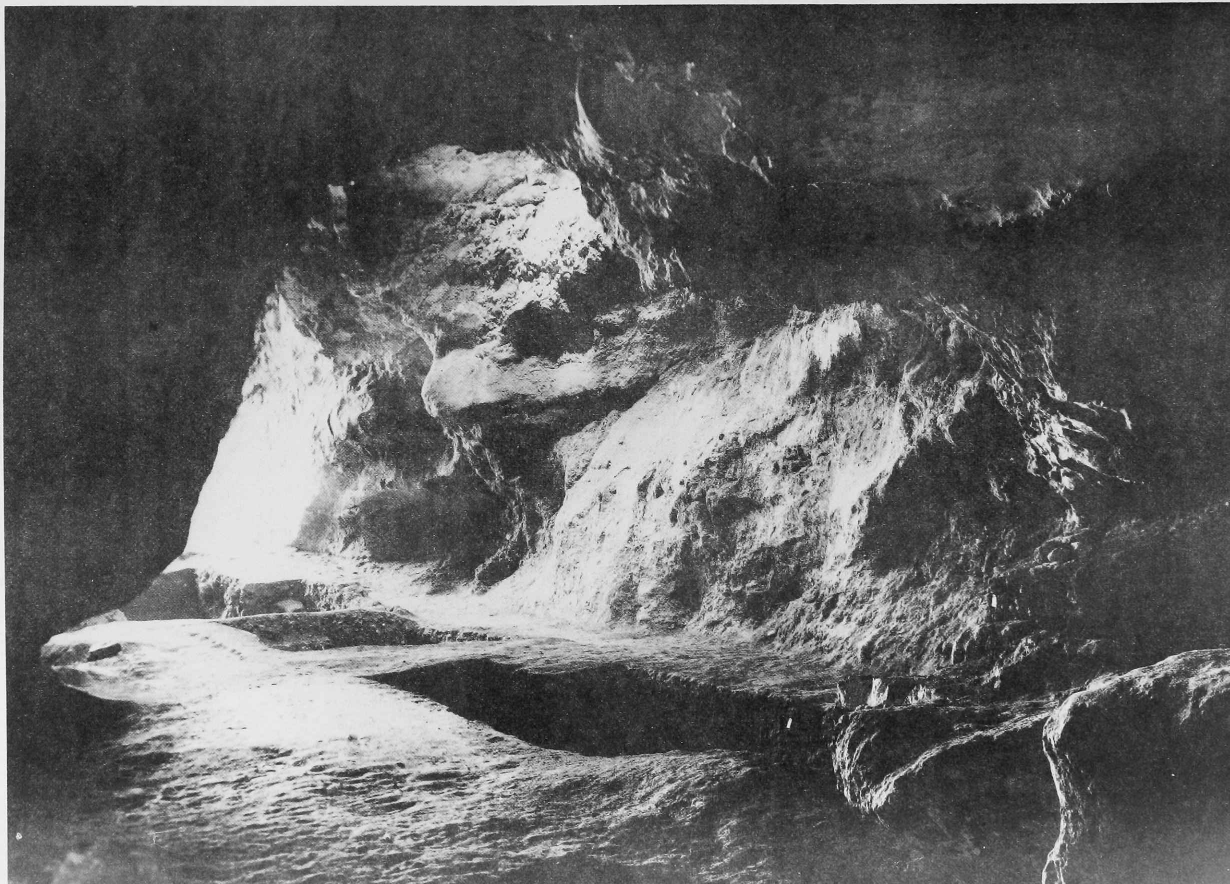


Plate S.12. Interior of the cave, taken from the entrance to Cave V looking toward the main entrance. Centre, in the extreme foreground, the corner of Trench V is visible. Centre, Trench M with S and G beyond. For the dimensions of the features shown, see the plan in Fig.S.2.

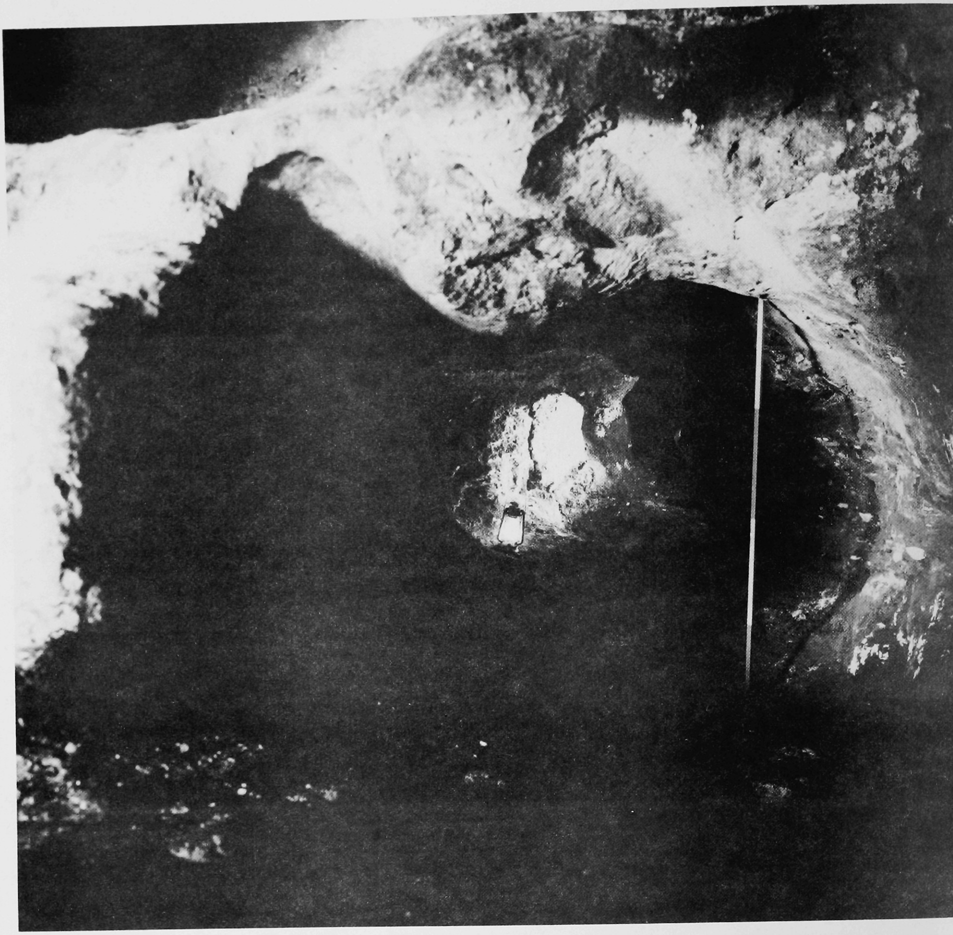


Plate S.13. Cave V interior and the eastern tunnel (illuminated by a lantern), showing hard breccia adhering to walls and ceiling.

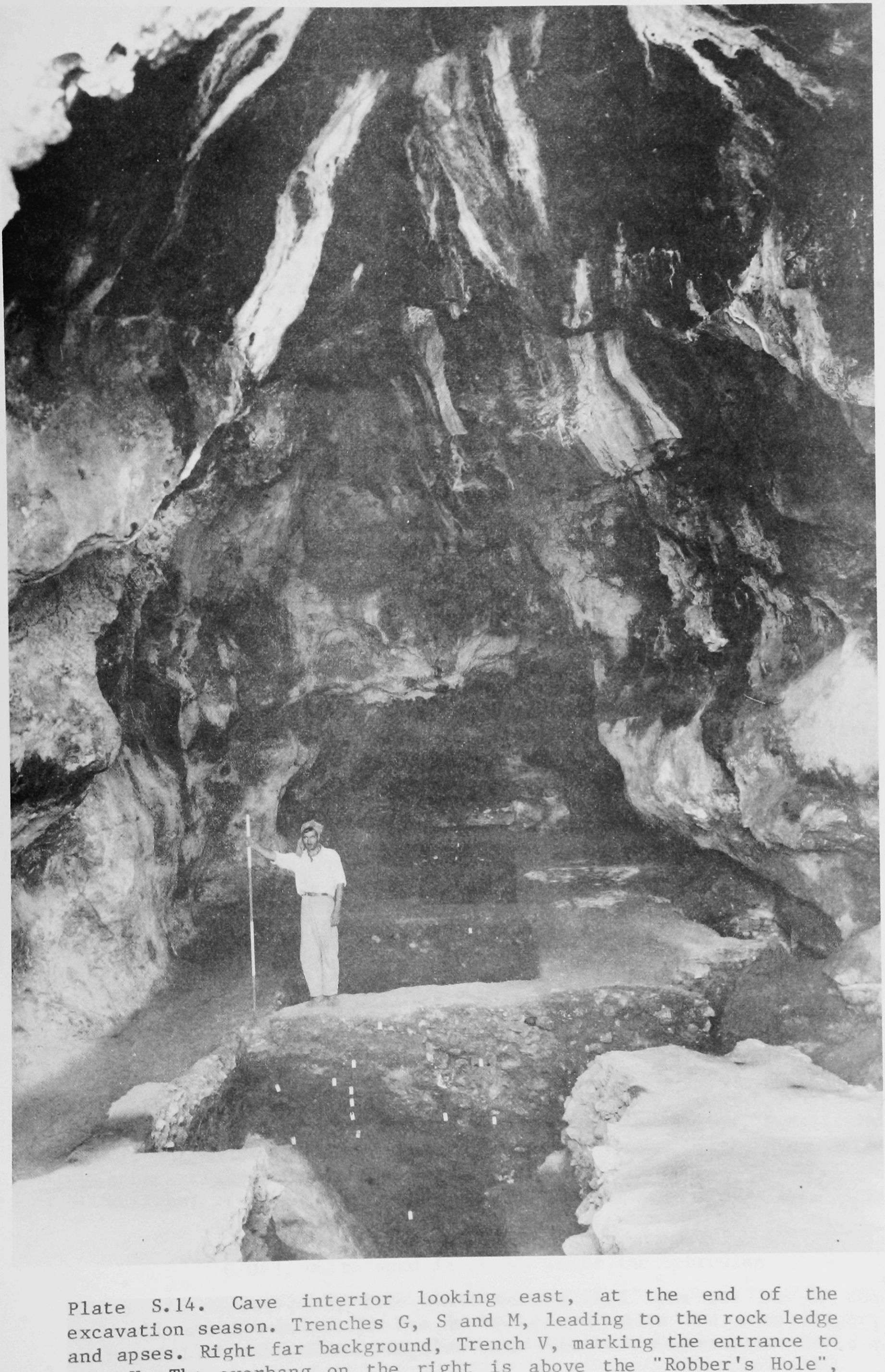


Plate S.14. Cave interior looking east, at the end of the excavation season. Trenches G, S and M, leading to the rock ledge and apses. Right far background, Trench V, marking the entrance to Cave V. The overhang on the right is above the "Robber's Hole", just visible below. The white band on the walls shows the height of the original deposits removed by Division I: at the rear it is high ... tuated just below the dissolution dome that

## APPENDIX A
## NOTES ON SOME SOIL SAMPLES FROM BEZEZ CAVE
by I.W. Cornwall

### INTRODUCTION

Twenty-nine samples from Bezez Cave and the breccias in the vicinity of its mouth were received by Dr Cornwall from Professor Garrod. These were given a preliminary examination at the Institute of Archaeology, London, in 1965-66, and the following report was submitted. The samples are listed here very broadly in the order of the stratigraphic sequence in each trench in the cave, oldest first. The report was prepared in note form and is reproduced here with only minor editing.

### SAMPLE (f)
(The label states: Dark red sand on bedrock at base of Trench G: ?Pre-Yabrudian?)

The sample is of red loamy (rather than sandy) material, faintly calcareous, with some slight phosphate. Concretions of silt and very fine sand resist boiling in concentrated HCl; silicious, but the iron is colloidal and disperses straightway in cold dilute acid. The material seems to be mainly soil-derived, if not in situ (e.g. the B-horizon of a Braunlehm somewhat enriched with iron and clay-colloids). It could have formed a coating of terrestrial deposit overlying the bedrock before the rise of sea-level which brought about the beach formation. The deposit may originally have been thicker, and have been somewhat eroded by wave-action before the deposition of the shingle on its residual surface.

### SAMPLE (w)
white beach sand from G54

This is a fine, loose white sand, 90% quartz. There is a little silt-grade material, very few larger vein-quartzes, sandstone grains, ferruginous concretions and clay-crumbs. It seems to be a lens of white, polished beach sand, and corresponds closely with sample (n).

### SAMPLE (n)
Reddish sand from G50a

Slightly loamy, fine beach sand of external origin, with humus and considerable iron (red on ignition). There are a few larger quartzes, well rounded and polished. The washed sample shows extremely good grading and there are no foreign bodies, i.e. it is without evidence of persistent human occupation in the form of a substantial concentration of phosphate: if anyone occupied this surface, it could only have been temporarily.

### SAMPLE (g)
G/D48, white sand in corner under the Yabrudian

An almost pure, fine white quartz sand from the lip of the small swallow-hole. It has a few clay-pellets and some larger, rounded vein-quartzes, and also some sandstone concretions. It is a

lens of finer beach sediment, locally replacing shingle, and must have come in from outside the cave, since it shows traces of prior wind-abrasion of some of the grains.

SAMPLE (x)
From G48, Yabrudian

Non-calcareous grey-brown soil with water-stable lumps (clay) and flint débitage. Some angular vein-quartzes up to 2mm. Soil-crumbs are medium-sandy in grade. The flint débitage is white-patinated. There is also fine polished clear quartz beach sand, plenty of organic matter (lost on ignition) and some iron, but very little charcoal. This represents a Yabrudian occupation horizon, i.e. it is beach sand mixed with the usual dark organic matter and occupation debris. Very like samples (k) to (n).

SAMPLE (t)
G/K48, Yabrudian

Grey brown very humic fine soil with débitage, very like samples (k) to (n). Washing with water gave the same two-graded sand, more or less ferruginous. The mineral part is beach-sand, but it is thoroughly mixed with organic matter, charcoal crumbs and general occupation debris.

SAMPLE (p)
G/D Baulk, on rock under Yabrudian

Porous, yellow-brown granular concretion, locally with ferruginous precipitates. It is non-calcareous and relatively insoluble in dilute HCl, but phosphate is present in quantity. Essentially, the material is phosphate-rock. There are two grades of acid insolubles: (1) large, rounded grains, chiefly of vein-quartz, up to 1.5mm. in diameter, including some which have first been well rounded (?by wind) and then polished (on the beach); (2) the usual well-graded fines. There are a few angular flint particles (?débitage). Most of the fines are of clear quartz.

The sample consists essentially of ferruginous beach-sand, concreted with secondary calcium phosphate, perhaps some long time after the Yabrudian occupation, since the débitage occurs in the concreted mass.

SAMPLE (a)
G and G/K45, corner of G trench below red soil

Fine, silty, mainly quartzose (clear and vein-quartz) sand, with scattered ferruginous concretions, only the latter being calcareous. Muscovite mica is present.

The residue, on washing, was a well-sorted fine sand with some micas. There were a few larger, wind-rounded quartzes, but most of the grains greater than 0.5mm. were polished as well as rounded. On treatment with concentrated acid, the iron dissolved with difficulty and some grey-brown clay pellets resisted disintegration.

This is probably beach deposit but there are no foraminifera to confirm this diagnosis. The almost complete decalcification is

responsible for the destruction of these and of any shell-fragments which might have originally been present.

SAMPLE (k)
From Trench G, Levalloiso-Mousterian occupation

This is full of organic matter, charcoal and phosphate and consists of fine, dark humic soil. The colour is largely discharged on ignition, i.e. is organic matter. After washing with water, the residue is grey clay crumbs, a few of them burnt red. Some large wind-rounded quartzes and many smaller. After acid-extraction, the sample shows charcoal in addition. There is much phosphate.

In its present position, this layer can clearly be seen to have slumped a little, but without important internal disturbance.

SAMPLE (z)
From G43, Upper Palaeolithic/Levalloiso-Mousterian contact

This is similar to sample (y), from the Levalloiso-Mousterian, but much more silty, with biggish (10mm.) water-stable concretions. The dark colour is due to the presence of much organic matter and there is plentiful finely-divided charcoal also. If sample (z) actually belongs to the Upper Palaeolithic phase, then there is no essential difference in the character of the deposit from that in the underlying Levalloiso-Mousterian.

SAMPLE (r)
Sill of Bezez Cave, Trench D (Lartet breccia). Yabrudian

Calcareous bone-breccia, identical with (q), except that it also contains some fragments of carbonised bone. It seems to be occupation deposit, but it is not clear whether it is undisturbed where it now is, some of it having been eroded away, or whether it was a lump fallen from the wall, secondarily brecciated and now re-cemented (the detachment could have occurred due to twist and shear related to the main subsidence). Alternatively, were the quarriers responsible?

It seems possible that this sample is from an undisturbed deposit, which could have reached as high as the top of the wall deposit; if so, how much has been removed by erosion or by the quarriers?

SAMPLE (o)
From Test-trench K16

Yellow-red silt, slightly calcareous, but dispersed, not particularly in the concretions, which are of calcium phosphate.

This seems too clean for an occupation-horizon, and is most likely natural beach material; the phosphate could be from secondary infiltration, perhaps from an overlying occupation-horizon.

SAMPLE (j)
From Test-trench K14

Deeply patinated rounded flints with non-calcareous concretions: effervesces in hot, dilute HCl, and may be dolomite. Much phosphate present, but only a trace of magnesium. Concretions must be calcite and apatite, the latter protecting against the cold acid. The acid insolubles are fine sand and flint débitage only.

This is beach material, with occupation in situ or re-worked occupation debris. The cement is certainly secondary, and was incoherent during the occupation.

SAMPLE (i)
From Trench K, 13a

Calcareous fine gravel. The red-brown silt and clay washes off the stones. There is a little humus. Acid-insolubles are grey clay pellets and very fine quartz sand. This is probably of external origin, but perhaps somewhat mixed with occupation material. It is rather like (f).

SAMPLE (b)
From S105, the swallow-hole. Mixed material

Brown, but with white and red-stained precipitates in root-holes and fissures. The sediment breaks down directly into clay crumbs with cold water only. When dispersed by boiling and allowed to sediment, it formed tiny flocks at once (concentration of Ca-ions, but tests for carbonate and sulphate were negative, so it is not gypsum). The white veining was calcium phosphate, presumably derived by percolation and re-deposition from some bone-bed further up the succession. Thin sectioning revealed colloids throughout the fabric, showing the material to be soil, in the strict sense, but these are now dehydrated and almost completely isotropic. A Rotlehm type soil, sunbaked in summer arid conditions.

In brief - red clay with infiltrated phosphate. From its position in the swallow-hole and below the chimney, this was almost certainly sub-aerially formed: a sub-tropical plastosol soil material, of terra fusca type, washed in, redeposited and subsequently impregnated in situ by percolation of dissolved phosphate from somewhere higher up the section.

SAMPLE (l)
Surface of Trench S

Mainly identical with (k). On washing, the sample showed grey clay-crumbs and fine quartz sand, possibly from a beach. It is occupation material, collapsed into the swallow-hole. Since its exact position is not given, the degree of disturbance cannot be estimated, but if the collapse was fairly slow and gentle, a layer well sandwiched between two others would merely suffer distortion rather than substantial displacement of its particles, whereas a sudden fall would cause inextricable confusion.

SAMPLE (m)
From M155, bone-bearing breccia on the beach

Much like (l), but calcareous throughout, with concretions and bones. Plenty of humus. Acid insolubles are clay crumbs and quartz sand. This dark humic soil is an occupation on the surface of the rock.

SAMPLE (y)
From M150, Levalloiso-Mousterian

Very similar to the series (k)-(n) and also to (t) and (x). Much organic matter, charcoal, débitage, red bone fragments, burnt and unburnt clay crumbs, fine quartz sand, clay-encrusted. Not quite so ferruginous as the (k)-(n) samples.

SAMPLE (u)
From V201, mixed material

'Vitrified' flint cores: nothing deposited on them, but the surface is polished by sand-blast with a later ferruginous incrustation. The only partial polish of the objects suggests that they were fixed in a desert pavement so that only their exposed surfaces received the polish. The incrustation effervesces in cold concentrated acid, but not in dilute. Iron carbonate, siderite.

Those sand-blasted flints with ferruginous incrustation were surely not from the cave itself, but must have been brought in from some exposed surface in the open air.

SAMPLE (h)
V198, Levalloiso-Mousterian and mixed

Grey brown crumbly, with some humus. Dilute HCl dissolved out some limonitic iron, and much more was dissolved in concentrated acid. The grey colour was discharged on ignition, but some black grains persisted (magnetite). The sample is a soil, consisting mainly of quartz sand with some dark grey clay concretions of all grades.

This is evidently occupation material laid down where it now is, not external soil material. Its situation practically precludes its derivation, save at several removes, from outside the cave. Any suggestion of a relatively low temperature applies, plainly, only to the micro-climate of the cave-interior.

SAMPLE (c)
From V198, brecciated, from wall in Cave V

Grey brown crumbly, with débitage, somewhat concreted. The colour is due to plentiful humus. It contains no carbonate or sulphate, but plentiful phosphate. An occupation horizon, but it is not clear how this was removed (washed out or quarried out?).

SAMPLE (d)
White material from V198

White crystalline band in material very like sample (f), a phosphatic deposit from trickling water on the wall, i.e. from a

free surface, not infiltrated. Could have been subsequently buried by renewed deposition of the humic grey sediment.

SAMPLE (q)
Breccia BBa

This breccia is just south of the cave-mouth, on the wall. It is a calcareous bone-breccia, with flints and _débitage_, but no charcoal. Insoluble in dilute acid; fine ferruginous sand and some soft, jelly-like masses of organic matter, quite amorphous. It is clearly an occupation deposit with plenty of bone and organic matter.

SAMPLE (v)
Breccia BBd

Three chunks of breccia fallen from roof or wall into ash pit. Upper Palaeolithic, but not _in situ_ according to the label. Much more porous than sample (q) and contains some _débitage_. Acid insolubles: fine quartz sand, fine-sandy grey-brown soil crumbs, some burnt red. Much organic matter and a little charcoal. There are a few larger wind-rounded quartzes. An occupation horizon.

SAMPLE (s)
Breccia BBg

Calcareous worm-tubes and land shells from breccia. I have sent these for determination by an outside opinion and await the results. (Editor's Note: As already mentioned in the text of Chapter 3, these samples cannot now be traced in spite of exhaustive enquiries. If the tubes had proved to belong to the sea-level dweller _Vermettus_, in view of the use made of this species by Fevret and Sanlaville (see Sanlaville, 1977, p.728f.), they might have contributed significantly to our understanding of the cave's chronology.)

SAMPLE (e)
Breccia BBc, fallen from Trench K wall into pit

Calcareous bone-breccia containing much sharp flint _débitage_, numerous burnt clay crumbs and fragments of charcoal. Confirmed by concentration of these insolubles on decalcification. A typical occupation-deposit, but not _in situ_ in the pit.

## SECTION II
## ABRI ZUMOFFEN, 1958, IN RETROSPECT AND THE EXTENSION, 1963
by Lorraine Copeland

The Abri Zumoffen rockshelter, located some 69 paces north of Bezez Cave (see Fig.S.12), was excavated by Garrod and Kirkbride in 1958. Zumoffen Cave, which opens off the south end of the rockshelter, was also examined at that time, but the landlord stopped the excavation and dug it out himself in search of treasure. A comprehensive report on the work at Adlun appeared in 1961, containing inventories, plans, sections and photographs (Garrod and Kirkbride, 1961; hereafter called 'the 1961 report').

In 1963, the same team returned to Adlun. As described by Garrod (1966), they were obliged to await the completion of the 'Division I' excavation in Bezez Cave by the Department of Antiquities, and during this time they were able to carry out some limited work at Abri Zumoffen. This consisted of the rehabilitation of Zumoffen Cave and an extension of the upper part of Trench B (see Fig.S.12) in the shelter area.

The lower chamber of Zumoffen Cave was cleared, so that the stratigraphy of the walls of the shaft could be seen in section, and it was then mapped by Colonel Skinner (Fig.S.13). The artifacts, which the landlord had thrown out with the cave earth, were collected and found to include a mixture of typical Amudian and Yabrudian types; they were brought to London to form a typology collection, and will be reported on separately as a typological study. They are marked "AZ.Ext.'63". In the time available it was not possible fully to connect Trench B and Zumoffen Cave except at the surface.

Later, when the material of the 1963 excavation of Bezez Cave was being studied during 1964, it could be seen that the discoveries there would throw new light on the sequence found at Abri Zumoffen in 1958. In retrospect, it is clear that the Abri Zumoffen Beach Industry in particular contained elements relevant to the material found in the basal archaeological layer, C, at Bezez.

Meanwhile, the fossil shorelines of the Lebanese littoral were being intensively studied by P. Sanlaville; as a result, much new information on the marine chronology was gradually becoming available (Fleisch and Sanlaville, 1967; Fleisch and Sanlaville 1969, recently synthesised in Sanlaville, 1977). It became clear that, if all the information from Bezez and the shoreline studies were to be integrated with that of the earlier work of 1958, both the industries and the stratigraphy of the Abri Zumoffen should be re-examined, keeping in mind the new data.

In this section, the stratigraphy of the lower layers uncovered in the 1958 excavation (i.e. those actually in contact with marine features) will be summarised (Fig.S.14) and the correlations between this sequence and the chronological scheme of Sanlaville will be discussed. However, the artifacts are described separately in Chapter 4, Section II, the fauna in Chapter 7 and our own archaeological conclusions in Chapter 8, together with a

suggested overall chronology for the Adlun sites (Table R.1 on p.416).

The following resumé must be read in conjunction with the 1961 report, and with the sedimentological report and chronological scheme given by Zeuner, Cornwall and Kirkbride (1961).

SUMMARY OF THE STRATIGRAPHY RECORDED AT ABRI ZUMOFFEN IN 1958, IN THE LIGHT OF RECENT SHORELINE STUDIES

The base of all three of the 1958 exposures, Trenches A, B and C, contained Beach Industry artifacts; in Trenches A and B, the Beach Industry lay in and on a fossil beach at c. 12m. above present sea-level, and in Trench C it lay on a similar pebble beach at c. 11m. (Fig.S.14, and see also the published sections in the 1961 report). In Sanlaville's scheme these beach exposures would equate with the Enfean IIa transgressions, in the second half of the Last Interglacial (Table R.1: left-hand column). In front of the rock-shelter, the beach seemed to have covered intensely cemented older soil and breccia layers, and it also evidently extended into the area of the shelter overhang and even into the adjacent fissure, Zumoffen Cave (Fig.S.13). The older cemented deposits are presumed to be resting on the underlying marine abrasion-platform, which is here polychronic, as is the dead cliff above it (see Sweeting in this volume and Sanlaville, 1977, p.692).

The deposits above the beach were carefully excavated, following the geological layers. In a depth of 1.80m., 21 distinct layers (some of them subdivided) were noted in Trench A. Above the Beach Industry were Amudian occupation layers containing intact hearths, with which bone and flint were associated. The soil of these Amudian layers was derived - either by wind or erosion - from the cliff-top (Zeuner et al., op.cit., p.49), and the layers were separated from each other by calcreted bands of similar, but sterile, soils; the cementation was attributed by Zeuner et al. to the action of rain and sea-spray.

TRENCH A

Trench A (Fig.S.12) was 1m. wide by 14.80 long, running from the centre of the cliff overhang at its junction with the marine platform, across the terrace toward the sea. The stratigraphy of the consecutively-lettered metre squares was not uniform, weathering and rockfalls having affected some of the upper portions. The squares which concern us here are those in which the excavation was carried down deeper, to the level of the fossil marine beach; the layers are described from the base upwards:

A, square S-T:

1 Travertine or cemented limestone breccia (not bedrock), with surface at 11.66m. above sea-level. (Pre-Enfean?)

2 Red brecciated clay soil, surface at c. 11.75m.

3 "Lower Beach", c. 50cm. thick, surface at c. 12.20m.; consolidated coarse sand, sea shells and large and small pebbles. (These must surely exemplify the galets hétérometriques of Sanlaville (op.cit., 1977) so

characteristic of the Enfean.) As this level overlay (1) rather than bedrock, Zeuner regarded it as a storm beach. Beach Industry at top.

4 Dark brown breccia, c. 12cm. thick. Beach Industry.

5 Light brown breccia with pebbles and rubble, c. 12cm. thick. Beach Industry.

6 Dark brown breccia, c. 8cm. thick. Beach Industry.

7 Stone heap in centre of square, coming from square U, which effectively separates (4) and (5) above, which occur in the north side of the trench, from the layers in the south side. Sterile.

8-13 A series of three occupation floors alternating with three calcrete bands, each 2.3cm. thick, base at c. 12.50m. The floors are c. 8, 10 and 11cm. deep respectively. As mentioned above, the soil of the calcrete bands which separate the floors from each other differs from that of the floors only by being both cemented and sterile. This group is tentatively equated with levels (15) to (11) further west, and it enters square ST sloping upwards from west to east (see photo, Garrod and Kirkbride, 1961, Plate III). The industry of the floors is Amudian.

14 On the south side of the trench a further series of occupation floors, separated by calcrete bands, begins at 12.80m.; each is about 12cm. thick and after 40cm. they merge into a grey breccia which also covers those layers numbered (4) - (6) and described above. The details do not concern us here, and the industry is Yabrudian.

A, square R. The north side of the square being blocked by a large cemented stone heap, only the south side could be excavated; in a depth of c. 67cm. this contained:

1 Beach deposit similar to that in S-T, with surface at c. 12.20m., considered to correspond to the Lower Beach of ST (3). Excavated to a depth of 35cm. At the top, Beach Industry.

2 Thin red gravel layer. Beach Industry.

3 Weathered zone of yellow-red soil. Artifacts of mixed Beach, Amudian and Yabrudian types.

A, square P-Q:

1 At the base, "Upper Beach", with surface at 13.25m., described as an intensely hard consolidated sand, coloured orange-pink from colloidal iron, containing sea shells and large beach pebbles. Only 20cm. at the top could be excavated. Beach Industry.

2 Red gravelly earth containing stones, some of them rolled, and sea shells. Beach Industry.

3 In square Q, a grey breccia layer with (?Amudian) tools intervened between (2) and (4).

4 Yellowish-red rubbly earth, containing the same mixed material as the weathering zone of R (3). In square P, it rested on the Beach Industry, and in Q, on the grey breccia.

A, square N-O:

1 Beach, sloping upwards from P, with surface at 13.25m., running into the rockshelter area. Beach Industry.

2 Grey breccia, continuing from P. ?Amudian.

3 Intensely hard, weathered deposits within the shelter overhang and at the drip-line. Sparse, mixed artifacts.

TRENCH B

The layers in Trench B were numbered independently of those in Trench A. This trench was intended as a contact between the platform layers and those inside Zumoffen Cave, but excavation was forcibly terminated by the landlord c. 2m. short of the cave mouth. Seawards from this point the stratigraphy generally matched that in A. The 1961 report includes a photograph of Trench B (Plate IV, right) and a section (V-VI), showing, from base to top:

B, square Q-R:

1 Layer 9. Orange sandstone beach of consolidated sand and large pebbles, with surface at c. 12.49m. Only 4 cm. of this deposit could be excavated. This beach was thought to correspond to the Lower Beach in Trench A. Beach Industry.

2 Layer 8. Sandy pink breccia, with a few sea shells. Amudian with some Beach Industry elements.

3 Layer 7. Hearth, c. 10cm. thick. Amudian.

4 Layer 6. Grey breccia, 10-25cm. thick. Amudian.

5 Layer 5. Brown earth layer with a weathering zone. Abundant animal bones. "Amudian with racloirs".

6 Layer 4. Grey breccia, 10-20cm. thick. Amudian at the base, Yabrudian at the top. Equated with level 9 in Trench A.

7 Layer 3. Yellow-red earth weathering zone. Yabrudian with blades.

B EXTENSION: SOUNDING IN ZUMOFFEN CAVE

In 1958 another part of Trench B had been opened up, a 1x1m. sounding into the floor of the cave just at the mouth. Zumoffen Cave itself is a solution cavity (in which one cannot stand upright) opening off the rock-shelter (Fig.S.13). In this case the layers are listed from the top downwards:

1 Red clay, with flints weathering out at the surface: the remains of a deposit which must correspond to level 1 of Trench A. Most of this had been removed, to make a vegetable garden, by the landlord in 1954; according to

him, it had once completely filled the cave. It seems to have contained an Acheuleo-Yabrudian industry. Artifacts from this horizon are marked B, L-Q.

2 Hard grey breccia, similar to that of A, N-P. Yabrudian at the top.

3 Dissolution cavity in the floor, over which the hard grey breccia had formed a ceiling. Loosely packed with beach pebbles, but without sand, which may perhaps have been carried away by underground drainage (cf. Garrod and Kirkbride, 1961, pp.18-19). Some flint, projecting into the cavity as well as into the base of the grey breccia ceiling. Beach Industry. Only seven artifacts had been recovered *in situ* (Plate Z.6, 1 & 2) when the landlord stopped the dig; they have been added to the total for B, Q-R.

TRENCH C

This was excavated, not in the area of the vanished "cove" (mentioned by Zumoffen) and shelter but outside, on the terrace, about 15m. from the mouth of Bezez Cave (see Fig.S.12). This spot had, however, been occupied; the small exposure of 1 x 1.70m. (sections VII-VIII and Plate 5 in the 1961 report) produced 358 artifacts in 4 separate layers whose combined depth was 90cm. From base to top, the sequence was as follows:

C, Layer 4 — Beach deposit, intensely hard, packed with large and small pebbles, with its surface at 11.51m. above present sea-level. Only 8cm. of this could be penetrated, producing both bone and flint. The beach was thought by Garrod to be older than the beaches in Trenches A and B (see Table R.1, p.416). Beach Industry.

C, Layer 3 — Red clay, maximum depth 24cm., crossed by two undulating calcrete bands; a land surface, containing patinated artifacts. Amudian, with Beach Industry elements.

C, Layer 2 — A second beach, 50cm. thick, with its surface at c. 12m. above sea-level, consisting of pink marine sandstone. Layer 1 petered out, allowing layer 2 to outcrop on the lower slope west of the trench. This beach was considered by Garrod to equate with the Lower Beach in Trench A. Unabraded Amudian, in every position (either redeposited or incorporated while the sand was still loose).

C, Layer 1 — Hard grey breccia, 34cm. thick (maximum), sandy at base, and crossed by two calcrete bands. Well-preserved bones; Zeuner noted (apparently without following up) traces of fossil marine organisms (were they perhaps Sanlaville's marine stage indicator, *Vermettus*?) on the surface at the west end of the trench. Here the breccia has a sort of nick, forming a minute concave cliff at c.

12.25m. a.m.s.l. Amudian, again with Beach Industry elements, considered by Garrod to equate with the Amudian layers 21-11 in Trenches A and B.

The Amudian of Trench C was not overlain by Yabrudian layers, as was the case in Trenches A and B; as the location was nearer the shore, the upper part of the original sequence may have been truncated during the Naamean transgression, so that the surviving record may be incomplete.

DISCUSSION

The Abri Zumoffen deposits were first interpreted chronologically by Zeuner et al. (1961, pp.52, 59), who placed the fossil cove area (which contained the shelter) in the Late Monastirian or Riss/Würm, the sea being then at +10m. altitude. The Beach Industry was placed in the same phase, after a climatic oscillation of sufficient duration for soil to form on the platform, and after this soil had in turn been covered with beach material. Beach Industry and Amudian levels were then built up concurrently with the weathering of the cliff, the fallen earth being colluvial terra fusca. Cementation ensued at the beginning of the Last Glacial retreat of the sea, while the Yabrudian layers were being laid down on top of the Amudian. The pink sandstone beach in Trench C was attributed by Zeuner to an interstadial, his Epi-Monastirian (ibid., p.59).

A modification of this view is suggested in footnote 2, on page 43 of the 1961 report; this telescopes the sequence by placing all the beaches at the start of the recession from the "15m. beach level" with the exception of the basal beach of Trench C, which was regarded by the excavators as preceding the others.

More recently, Sanlaville has, like Zeuner, equated the basal Trench C layer (Layer 4) with those in Trenches A and B, his reason being that all consist of the heterometric pebbles which typify Enfean II beaches at various locations elsewhere along the coast (Sanlaville, 1977, Fig.233, p.705). Layer 1 of Trench C is equated with a later episode, even though it is fairly high (12m.). For him, the Beach Industry would have occurred at the time of the Enfean II stands of 10m. and 13m., with the Amudian layers coming later, at the start of the retreat phase of his Eowürm. However, it must be noted that the pebble beaches in Trenches A, B and C differ from those of the Enfean in having no Strombus bubonius fossils among the fauna.

Although these thermophile molluscs have long been known to occur in marine deposits at 6m. to c. 15m. altitudes in North Lebanon (Wetzel and Haller, 1949), they have only recently been found on the Southern Lebanese littoral by B. Lauriol and P. Sanlaville. (The list of fauna at one of these findspots, the Strombus beach at Naamé, is given in Appendix A, Chapter 7.) This is of considerable interest since three Strombus findspots are known in the vicinity of Adlun (Map, Fig.H.3, 3) and one is directly north west of the prehistoric sites, at Minet Abu Zebal, which can be seen on Plate S.2. The Strombus fossils were found on the south bank of a minor wadi which debouches into the bay here,

and Sanlaville (1977, Fig.231, p.698) reports the following stratigraphy.

1 Sea-level (and below) to c. 1m. above sea-level: Cemented coarse marine sand with detritus of shells. Granulometric index is 0.84mm.

2 A c. 30cm. thick layer of conglomerate; heterometric beach pebbles, with macrofauna including many Strombus. This overlies the cemented sand unconformably. Heterometric index is 0.98 (ibid., p.150).

3 Another layer, c. 50cm. thick, of coarse marine sand, similar to the first, with shell debris, perhaps truncating the Strombus conglomerate.

This important and interesting section at Minet Abu Zebal is published in more detail in Fleisch and Sanlaville, 1967.

These deposits extended eastwards towards the caves but disappeared under the modern banana groves with no sign of a parent beach (this has never been found in the Enfean sites in south Lebanon). The marine fauna found in the Abri Zumoffen pebble beaches was identified by G. Lecointre (in Garrod and Kirkbride, 1961, p.41) as 'banal', the species being found not only in Pleistocene beaches but also in those of the present Mediterranean (see also Garrard, infra). However, Sanlaville is willing to risk the following tentative correlations: The Strombus beach at Minet Abu Zebal is the same as that in Abri Zumoffen, Trench C, layer 1; the uppermost cemented sandstone at Minet Abu Zebal is the same as the pink sandstone beach in Trench C, layer 3.

From the above it will be seen that there are two alternatives for the placement of the Trench A Beach Industry at Abri Zumoffen: it is contemporary either with the lower beach in Trench C or with the uppermost beach. In the opinion of this writer, the data from Bezez Cave indicate that the former interpretation is to be preferred.

Note: The only available photograph of the Abri Zumoffen in 1958 is shown in Plate S.15 (page 86). This photograph, with Fig.S.12, gives a good impression of the close relationship between the two sites, Abri Zumoffen and Bezez Cave.

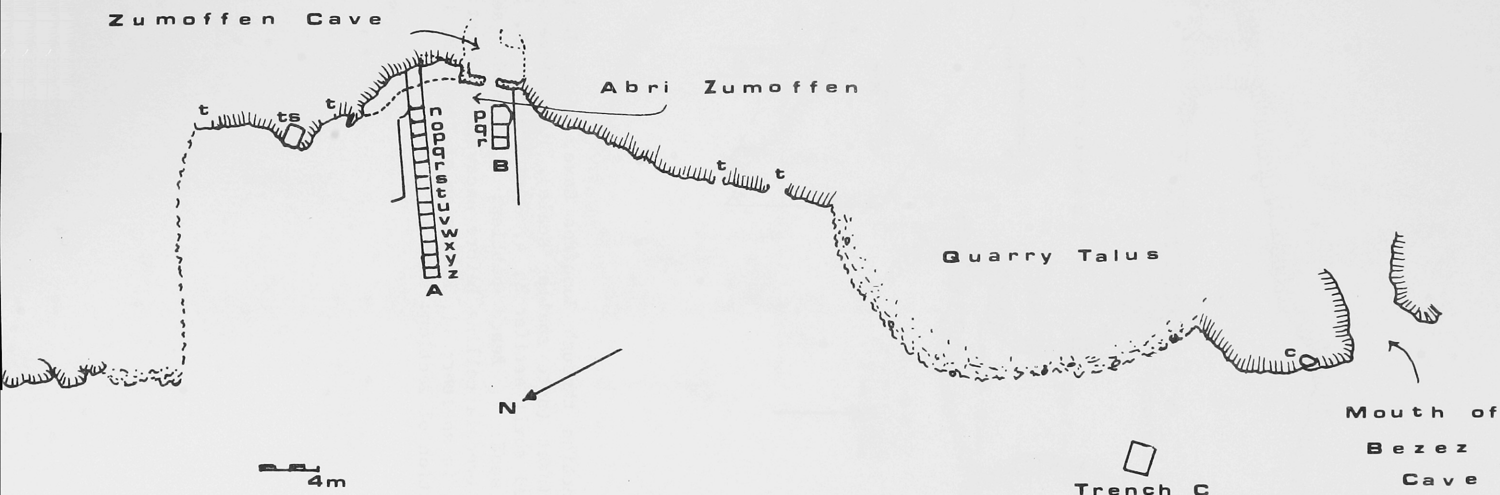



Fig.S.12. Plan of the Adlun marine terrace to the North of Bezez Cave as it was at the end of the excavations of 1958 (after Garrod and Kirkbride, 1961), to show the relationship of the cave to the shelter and terrace. (t = rock-cut tomb; ts = tomb shaft; c = cistern; all are Recent.)

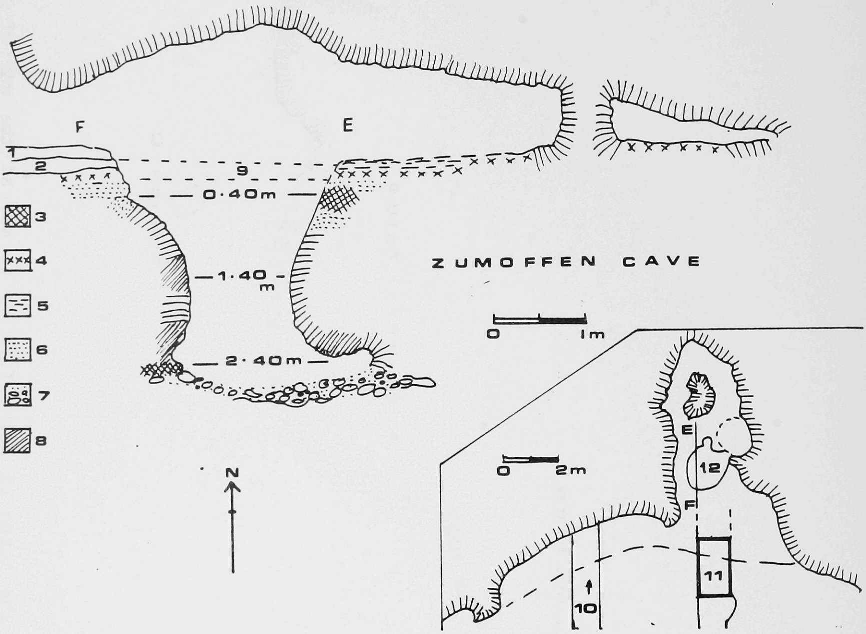



Fig.S.13. Section through Zumoffen Cave, after J. Skinner, 1963, with plan, inset (note smaller scale). 1, Surface soil; 2, Terra fusca; 3, Red soil: artifacts; 4, Grey breccia; 5, Stalactite; 6, Coarse red sand; 7, Beach pebbles; 8, Ramleh (aeolianite); 9, Position of breccia ceiling before excavation. Inset: 10, East end of Trench A, in shelter; 11, Extension of Trench B, 1963; 12, Locus B, L-Q; Position of section: E to F.

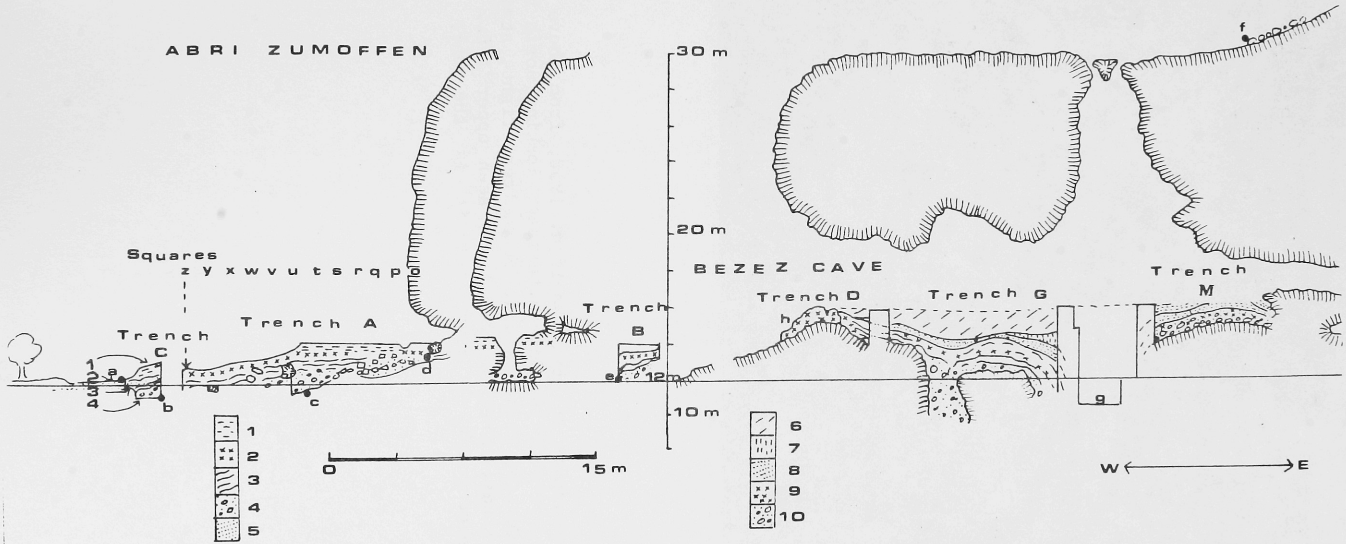



Fig.S.14. Schematic section, looking North, to show the elevations above sea-level of each excavation trench and locus at Adlun. They are placed in relation to a horizontal line at 12m. a.m.s.l. in random order. (After sections in Garrod, 1966, and Garrod and Kirkbride, 1961; see also our Figs.S.1 and Z.10.) In the key, nos.1-5 refer to Zumoffen sites and 6-10 to Bezez.

1, Acheuleo-Yabrudian in terra fusca; 2, Yabrudian in grey breccia in Trench A; 3, Amudian between calcrete bands; 4, Beach Industry in and on beach; 5, Pink sandstone beach, level 2 of Trench C; 6, Neolithic and recent fill; 7, Upper Palaeolithic, Level A; 8, Levalloiso-Mousterian, Level B; 9, Acheuleo-Yabrudian, Level C; 10, Beach material. Points above sea-level: a) 12.0m. b) 11.51m. c) 11.65m. d) 13.65m. e) 12.48m. f) The 33m. beach above cave; g) Swallowhole in Trench S; h) Sill breccia



Plate S.15. The excavation at Abri Zumoffen, 1958, from above the roof of Bezez Cave. View of the Enfean terrace, looking north from above Bezez cave. Centre, Trench A and the shelter, right, at foot of cliff. The small bay, Minet Abu Zebal, is seen upper left. The quality of the photograph is poor, but it is the only one available.

# CHAPTER 4
# THE STONE INDUSTRIES
by Lorraine Copeland

## SECTION I
## THE ACHEULEO-YABRUDIAN OF BEZEZ CAVE, LEVEL C

### INTRODUCTION

Chapter 4 is concerned with the technology and typology of the flint artifacts found in Bezez Cave and Abri Zumoffen. For the writer, as for Professor Garrod, the often tedious, but indispensible, task of classification and analysis of artifacts is but a means to an end: the better understanding of the human population who made and used them. For this reason they will be considered in ascending levels of importance: individual pieces; typological groups; stratigraphic assemblages; their context in the cave; the relations of their makers with other Palaeolithic communities.

In Section I we are concerned with the Acheuleo-Yabrudian industry which, as has already been described, is present in the several layers making up Level C, at the base of the archaeological deposits. It will be recalled that the industry is in contact with a fossil beach lying on the cave floor at about 15m. above present sea-level. Although interrupted by the largest swallow-hole (Trench S), as well as the north-to-south baulks, the beach together with Level C runs the length of the cave from its mouth almost to the rock ledge above Trench M, beyond which, at the eastern extremity, Cave V lies. Given that Level C is directly connected with a specific episode in the Levant Quaternary sequence, with all the implications for Late Pleistocene studies this has outside Bezez Cave itself, it is imperative that the characteristics of the industry be made clearly recognisable, and this is why we have dwelt on the Level C lithic typology at some length.

The writer stresses that neither Professor Garrod nor Miss Kirkbride is to be held responsible for any personal opinions and speculations expressed, in this chapter or in the final chapter; on some rare occasions her ideas may differ slightly from theirs.

### PRELIMINARY WORK ON THE MATERIAL

More than 2,000 pieces of flint, 1,128 of them from undisturbed layers, were recovered by Garrod and Kirkbride from Level C in 1963. Preliminary sorting and analysis of the material was carried out by the writer together with Mlle. Suzanne de St. Mathurin, in Beirut during 1964. The division of the <u>in situ</u> material was then made, half going to the Lebanese Department of Antiquities, and half to the excavators (Table C.1). This latter collection was sent first to the London University Institute of Archaeology, where, thanks to the facilities most generously made available, it was stored and studied by the present writer and S. de St. Mathurin until 1973; the bulk of it has now been sent to the University Museum, Cambridge (Professor Garrod's <u>alma mater</u>) but one unit has been retained at the London University Institute. The Beirut collection is in the National Museum there, together with

| Units in Level C | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| A.1 Stratified layers | | | | | |
| M152 | 34 | 49 | - | 83 | 83 |
| M157-8 | 9 | 39 | 9 | 57 | 48 |
| G50 | 39 | 42 | 10 | 91 | 81 |
| G48=50 | 15 | 20 | 1 | 36 | 35 |
| G48 | 69 | 176 | 102 | 347 | 245 |
| G/K48 | 37 | 49 | 34 | 120 | 86 |
| D/G51 | 20 | 7 | 10 | 37 | 27 |
| D/G48 | 96 | 128 | 48 | 272 | 224 |
| D256 | 42 | 57 | 21 | 120 | 99 |
| D255 | 68 | 136 | 79 | 283 | 204 |
| D257 | 37 | 51 | 4 | 92 | 88 |
| Totals | 466 | 754 | 318 | 1538 | 1220 |
| A.2 "Tayacian" units | | | | | |
| D/G48b | 11 | 42 | 1 | 54 | 53 |
| G/K48b | 21 | | 1 | 22 | 21 |
| D255b | 12 | 32 | 24 | 68 | 44 |
| "Tayacian" totals | 44 | 74 | 26 | 144 | 118 |
| A.3 Breccias *in situ* | | | | | |
| BBh | 10 | | | 10 | 10 |
| B Disturbed layers | | | | | |
| K14 (Test-trench) | 1 | 8 | | 9 | 9 |
| S102 (swallowhole) | 1 | 25 | | 26 | 26 |
| V197-202 (burrows, Victoria Cave) | 5 | 209 | | 214 | 214 |
| G40b (small swallowhole) | 3 | 37 | | 40 | 40 |
| G33 (pit in-filling) | 2 | 4 | | 6 | 6 |
| G49 (section-cleaning) | | 61 | | 61 | 61 |
| Group B totals | 12 | 344 | | 356 | 356 |
| Grand total | 532 | 1172 | 344 | 2048 | 1704 |

Table C.1. Inventory and present whereabouts of Level C flint material. 1) London & Cambridge Collection; 2) Beirut Collection; 3) *Débris* and fragments discarded after first sorting in Beirut; 4) Total excavated (sum of columns 1-3); 5) Working total (sum of columns 1 and 2)

the material not found in situ (Group B and column 3, Table C.1); the latter has been used to form typology collections for donation to Universities in Beirut.

## TERMINOLOGY

The Level C artifacts are referred here to the Acheuleo-Yabrudian industry. This term was applied by A. Rust (1950) to the assemblage of Yabrud, Shelter I, levels 24, 19 and 11, which contained a proportion of bifaces associated with tools similar to those in his Yabrudian levels, e.g. levels 25 and 22. Garrod adopted this nomenclature in 1956 for the whole of Level E at Tabun in place of her former term (of 1937) 'Upper Acheulean (Micoquian)'. In this report the term 'Acheuleo-Yabrudian' is used in a special sense, to be discussed below.

The term 'Yabrudian phase', as used here, denotes the transition period in the Central Levant between the time of the Lower Palaeolithic biface industrial traditions and that of the full Mousterian flake industrial traditions of the Middle Palaeolithic. It corresponds broadly to the span of time represented by Level E at Tabun and could include any non-Yabrudian facies which was contemporary with the Tabun E phase. Following Garrod (1956) it is counted as the earliest Middle Palaeolithic phase of the Levant. In terms of Quaternary stages, the Yabrudian phase took place during most, if not all, of the Last Interglacial, the period of the Enfean transgressions, and probably continued into the early stage of the Last Glacial. If some recently-obtained Th230/U234 dates can be relied on, Acheuleo-Yabrudian industries could have begun soon after 150,000 years B.P. and may have continued until about 80,000 years ago. (G. Hennig, pers.comm., 1981).

Concerning Quaternary terminology, recent articles by geologists have condemned the use in the Levant of such terms as 'pluvial' or 'glacial' and the 'rising' and 'falling' of the sea-level (the latter reflecting the question of isostasy versus eustasy); the use of Alpine phase names such as Würm or Riss/Würm has been even more criticsed (Butzer, 1975-77; Farrand, 1975-77). In the absence so far of agreement between our critics as to the best alternative system of reference, we have decided, as stated in Chapter 1, to employ the less prejudiced terms 'Penultimate Glacial', 'Last Interglacial' and 'Last Glacial' where we formerly used 'Riss', 'Riss/Würm' and 'Würm'. If we do sometimes refer to blocks of time by the latter names, it reflects our knowledge that, today, Alpine weather patterns frequently reach the Levant coast in wintertime; we presume this also occurred in the past, the effects being even more marked in certain glacial subphases.

For the marine sequence we use the scheme of Sanlaville, 1977 and 1981: Jbailian for the Penultimate Interglacial transgression (Mindel/Riss in Alpine terms), Enfean for the Last Interglacial high sea-levels, and Naamean for the early Last Glacial interstadial, the raised beaches of which represent the youngest Pleistocene sea-level visible on the littoral today (Stearns and Thurber, 1967); an alternative correlation for the Naamean would be to make it a Final Enfean episode.

In Chapter 1 we referred to the terms "15m. beach" and "6m. beach", used at the time of the Adlun excavations; these have since been dropped, following Sanlaville, who has shown that raised beaches at these altitudes and in tectonically stable areas could be either of Jbailian, Enfean or Naamean date, the sea having returned several times to virtually its previous level.

Concerning artifact terminology, 'tools' are those recurring types of implement thought to be significant relative to the rest of the assemblage, and are distinguished from other categories of artifacts such as cores and unretouched flakes (Table C.3). As for lithic typology, prehistorians are sometimes, especially of recent years, criticised for proliferating their typologies in a theoretical vacuum (G. Bailey, 1978, p.160). This writer submits that any theory not based on the detailed description of an assemblage and its context would itself be vacuous; she conceives of the following typological examination as forming such a base.

A Near East type list, devised by Père Francis Hours (1975) has been employed, with minor modifications, to list the artifacts because it reflects both the preliminary work done on the Adlun material in 1964 and the present work. It is based on the typology of already excavated Near Eastern material, and uses the criteria recommended by F. Bordes (1961). Two of these modifications are:

(a) categories of bifaces are listed in the order in which they appear in Table C.5, and

(b) composite tools are listed according to the 'order of dominance' of Bordes (1961, p.11) - for example, a racloir/burin composite would be placed with the burins.

It will be seen that technological, as distinct from typological aspects are frequently discussed; technological attributes are as listed in Table C.2, while in Table C.3 the same material is re-arranged according to its typology. The underlying assumption is that techniques have something to do with culture, and typology with function, so that both must be considered with equal care.

## METHOD

It was possible to study the artifacts of the Cambridge collection at leisure while they were in London; attributes of the tools were recorded on individual index cards and each unretouched piece was also measured and studied. The author studied the artifacts of the Beirut collection in 1972 in the National Musuem; measurements of some unretouched pieces could not be completed in the time available, but attributes of the bifaces were recorded on index cards and those of the other tool classes on data-sheets.

When it was found that the material in the nine most important archaeological units was indistinguishable on grounds of style, technique, condition, typology, raw material etc., the decision was made to amalgamate, for the purposes of descriptions in categories, the totals of each type of tool. However, since the proportions in which they occurred did vary considerably from one unit to another, this aspect is dealt with separately in the assemblage analyses.

| Categories / Layers | M 152 | M 157–8 | G 50 | G 48=50 | G 48 | G/K 48 | D/G 51 | D/G 48 | D 256 | D 255 | D 257 | Class total | General total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. Nuclei | | | | | | | | | | | | | |
| 1. Cores with permanent striking-platform | | | | | | | | | | | | | |
| a) Levallois | 4 | 2 | 3 | 1 | 2 | 2 | | 3 | 3 | 3 | | 23 | |
| b) Prismatic | 3 | 1 | 1 | 1 | 3 | 1 | | 6 | 1 | 2 | | 19 | |
| c) Double | | | 1 | | 1 | | | 2 | | 1 | | 5 | |
| 2. Cores without permanent striking-platform | | | | | | | | | | | | | |
| a) Discoid | 1 | 3 | | | 3 | 1 | 1 | 7 | 2 | 3 | 2 | 23 | |
| b) Conical | 1 | 1 | | 1 | 1 | 2 | | 2 | 1 | | 2 | 11 | |
| c) Polyhedric or globular | | | | | | | | | | | | | |
| 3. Other cores | | | | | | | | | | | | | |
| a) Amorphous and divers | 2 | 1 | 1 | | | 1 | 1 | 1 | | 2 | | 9 | |
| b) Fragments | | 1 | | | 1 | | | 1 | | 1 | | 4 | 94 |
| 4. Tools made on nuclei | 11 | 9 | 16 | 3 | 53 | 9 | 2 | 28 | 15 | 21 | 10 | 177 | 177 |
| B. Products | | | | | | | | | | | | | |
| 1. Levallois flakes | 1 | 2 | | 3 | 5 | 4 | 3 | 9 | 5 | 3 | 2 | 37 | |
| 2. Levallois points | | 1 | | | 2 | | 1 | 4 | 2 | 5 | 2 | 17 | |
| 3. Levallois blades | 6 | 4 | 2 | 2 | 7 | 1 | 1 | 16 | 6 | 1 | | 46 | 100 |
| 4. Non-Levallois flakes | 32 | 15 | 48 | 17 | 132 | 59 | 14 | 102 | 46 | 134 | 56 | 655 | |
| 5. Non-Levallois blades | 10 | 6 | 9 | 2 | 19 | 3 | 2 | 27 | 9 | 18 | 9 | 114 | |
| 6. Flakes made into cores or heavy-duty tools | 2 | | | 2 | 7 | | | 8 | | 5 | | 24 | |
| 7. Janus or Kombewa flakes | | | | | | | | 1 | 2 | 1 | | 4 | 797 |
| C. By-products | | | | | | | | | | | | | |
| 1. Biface-preparation flakes | 2 | 1 | | 1 | 2 | | | | 2 | 2 | 1 | 11 | |
| 2. Pseudo-Levallois points | 4 | | | | 2 | | | 2 | 4 | 2 | | 14 | |
| 3. Crested flakes | | 1 | | | 1 | 1 | | 1 | | | | 4 | |
| 4. Biface refreshment flakes | 2 | | | 1 | 1 | 1 | | 1 | | | | 6 | |
| 5. Fragments | 2 | | | 1 | 3 | 1 | 2 | 3 | 1 | | 4 | 17 | 52 |
| D. Débris | | 9 | 10 | 1 | 102 | 34 | 10 | 48 | 21 | 79 | 4 | 318 | 318 |
| Technical totals, by layer | 83 | 57 | 91 | 36 | 347 | 120 | 37 | 272 | 120 | 283 | 92 | | 1538 |
| Working total, i.e. débris omitted | 83 | 48 | 81 | 35 | 245 | 86 | 27 | 224 | 99 | 204 | 88 | | 1220 |

Table C.2. Technical analysis of the contents of eleven layers in Level C.

| Inventory / Layers | M 152 | M 157–8 | G 50 | G 48=50 | G 48 | G/K 48 | D/G 51 | D/G 48 | D 256 | D 255 | D 257 | Class total | General total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pebble tools: | | | | | | | | | | | | | |
| 1. Chopper | 1 | | 1 | | | | | | | 2 | | 4 | |
| 2. Chopping-tool | 4 | 4 | 3 | 1 | 6 | 1 | | 2 | 4 | 7 | | 32 | |
| 3. Inverse chopper | | | | | | | | | 1 | 1 | | 2 | |
| 4. Discoid chopping-tool | 1 | | 1 | | 1 | | | | | 1 | 1 | 5 | 43 |
| Bifaces: | | | | | | | | | | | | | |
| 1. Discoid | | | 1 | | | | | | 1 | | | 2 | |
| 2. Nucleiform | 1 | | | | | | | | | | | 1 | |
| 3. Ovate | | 1 | 2 | 1 | 7 | | 1 | 3 | 1 | 3 | 1 | 20 | |
| 4. Sub-ovate | 1 | | | | 2 | 1 | | 3 | 1 | 1 | | 9 | |
| 5. Naviform | | | | | | | | 1 | | 1 | | 2 | |
| 6. Limande | | | | | | | | 1 | | | | 1 | |
| 7. Amygdaloid | | | 1 | | 1 | 2 | 1 | 4 | | | 1 | 10 | |
| 8. Pyriform | 2 | 1 | 1 | | 4 | 1 | | 8 | | 3 | | 20 | |
| 9. Cordiform | 1 | 1 | 1 | | 3 | | | | | 1 | 1 | 8 | |
| 10. Elongated cordiform | | | | | | | | 2 | | | | 2 | |
| 11. Lanceolate | | 1 | 1 | | 4 | | | 1 | 1 | 1 | | 9 | |
| 12. Micoquian | | | 1 | | | | | 1 | | | | 2 | |
| 13. Triangular | | | 1 | | 4 | | | | | 1 | | 6 | |
| 14. Subtriangular | | 1 | 1 | 1 | 4 | | | 2 | 1 | 1 | 1 | 12 | |
| 15. Partial | | | 1 | | 3 | 2 | | | 1 | | 1 | 8 | |
| 16. Backed | | | | | | 2 | | 1 | | 1 | 1 | 5 | |
| 17. Divers | | | 2 | 1 | 5 | | | 1 | 4 | | | 13 | |
| 18. Fragments | 2 | | 1 | | 4 | 1 | | 1 | | 1 | 2 | 12 | 142 |
| Other Heavy-duty tools: | | | | | | | | | | | | | |
| 1. Pick | | | | | 1 | | | | 3 | | | 4 | |
| 2. Polyhedron type b | 1 | | 1 | | 1 | 1 | | 1 | 1 | | | 6 | |
| 3. Disc | 1 | | | | | 1 | | | | | | 2 | |
| 4. Rabot | | | 1 | | | | | 1 | 1 | 1 | | 4 | |
| 5. Massive scrapers and cleavers | | | | 1 | | | | 3 | | 4 | 2 | 10 | 26 |
| Levallois tools: | | | | | | | | | | | | | |
| 1. Typical and atypical Levallois flake | 1 | 2 | | 2 | 1 | 1 | 1 | 5 | 5 | 2 | 1 | 21 | |
| 2. Levallois point | | | | | | | | | 2 | 1 | 1 | 4 | |
| 3. Levallois blade | 3 | 3 | 1 | 2 | 6 | | | 10 | 4 | | | 29 | |
| 4. Retouched Levallois point | | | | | 1 | | | 2 | | | 1 | 4 | 58 |
| Mousterian tools: | | | | | | | | | | | | | |
| 1. Mousterian point | | | | | 1 | | | | | 2 | | 3 | |
| 2. Limace | | | 2 | | 2 | 1 | | | 1 | | 3 | 9 | |
| 3. Pseudo-Levallois point | 4 | | | | | | | | 1 | | | 5 | 17 |
| Racloirs: | | | | | | | | | | | | | |
| 1. Single straight | 3 | | 3 | | 12 | 3 | | 6 | 2 | 15 | 7 | 51 | |
| 2. Single convex | 1 | | 9 | 2 | 21 | 12 | 2 | 17 | 7 | 30 | 10 | 111 | |
| 3. Single concave | | | | | 2 | | | 2 | 1 | 3 | 1 | 9 | |
| 4. Double straight | | | | | 2 | | | 2 | | 1 | | 5 | |
| 5. Double straight/convex | | | 2 | 1 | 5 | | 2 | 1 | 2 | 2 | 3 | 18 | |
| 6. Double straight/concave | | | | | 1 | | | | 1 | | | 2 | |
| 7. Biconvex | | | 3 | 2 | 5 | 3 | | 5 | | 4 | 3 | 25 | |
| 8. Biconcave | | | | | | | | 1 | | 2 | | 3 | |
| 9. Double convex/concave | | | 2 | | 1 | | | 4 | 2 | 6 | 1 | 16 | |
| 10. Convergent straight, and straight/convex | | | | | 1 | 1 | | 1 | | 1 | | 4 | |
| 11. Convergent biconvex and concavo/convex | 1 | 2 | 3 | 1 | 6 | 6 | 1 | 8 | 2 | 11 | 4 | 45 | |
| 12. Convergent, Bezez-type | | 1 | 1 | | 3 | | | 4 | | 1 | 1 | 11 | |
| 13. Offset | 2 | | 3 | 1 | 10 | 3 | 1 | 7 | 5 | 9 | 3 | 44 | |
| 14. Triple | | | 1 | | 1 | | | 1 | | 2 | | 5 | |
| 15. Transverse straight | | | | | | 1 | 1 | 2 | 1 | 3 | 1 | 9 | |
| 16. Transverse convex | | 1 | 2 | 3 | 12 | 6 | 1 | 10 | 2 | 11 | 3 | 51 | |
| 17. Transverse concave | | | 1 | 1 | | | | | | 1 | | 3 | |
| 18. Inversely retouched | 1 | | 1 | | 4 | 1 | | 2 | | | 1 | 10 | |
| 19. Abruptly retouched | | | 1 | | 2 | | | 1 | 1 | | | 5 | |
| 20. With thinned back | | 1 | | | 2 | 1 | 1 | 1 | | 1 | 1 | 8 | |
| 21. Bifacially retouched | 2 | 2 | | | 8 | 2 | | 4 | 2 | 6 | | 26 | |
| 22. Alternately retouched | | | | | | 1 | | 4 | | 3 | 1 | 9 | |
| 23. Undetermined fragment | 1 | | 1 | | | | | 3 | 1 | 6 | 5 | 17 | 487 |
| End-scrapers: | | | | | | | | | | | | | |
| 1. Typical end-scraper | | | | | 1 | | | 2 | | 2 | | 5 | |
| 2. Atypical end-scraper | | | | | | | | 2 | | | | 2 | |
| 3. End-scraper composite | | | | | 1 | 1 | | | | 1 | | 3 | 10 |

| Inventory / Layers | M 152 | M 157-8 | G 50 | G 48=50 | G 48 | G/K 48 | D/C 51 | D/G 48 | D 256 | D 255 | D 257 | Class total | General total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| <u>Burins</u>: | | | | | | | | | | | | | |
| 1. Typical burin | 1 | | 2 | | 3 | | | 1 | 3 | 1 | | 11 | |
| 2. Atypical burin | 1 | | | | | | | 1 | 1 | | 1 | 4 | |
| 3. Burin composite | 1 | | | | | | | 3 | 2 | 1 | | 7 | 22 |
| <u>Perforators</u>: | | | | | | | | | | | | | |
| 1. Typical perforator | | | | | | | | | | | | | |
| 2. Atypical perforator | | | | | 1 | | | | | | | 1 | |
| 3. Perforator composite | | | | | | | 1 | | | | | 1 | 2 |
| <u>Knives</u>: | | | | | | | | | | | | | |
| 1. Typical backed knife | | | | | | | | 1 | 1 | 1 | 1 | 4 | |
| 2. Atypical backed knife | 2 | | 1 | | | 1 | | | 1 | 1 | | 6 | |
| 3. Nibbled piece | 1 | | | | 2 | 1 | 1 | 1 | | | | 6 | |
| 4. Backed knife composite | | | | | 1 | | | | | | | 1 | |
| 5. Naturally-backed knife | 5 | 1 | 1 | | | | | 6 | 2 | 1 | 2 | 18 | 35 |
| <u>Truncated Piece</u>: | 1 | | 1 | | 2 | | | | | | | 4 | 4 |
| <u>Notches and Denticulates</u>: | | | | | | | | | | | | | |
| 1. Clactonian notch | | | | | | | | | | | | | |
| 2. Retouched notch | 1 | 3 | 1 | 2 | 4 | 1 | 1 | 6 | 1 | 1 | | 21 | |
| 3. Denticulate | 3 | 1 | 2 | 3 | 13 | 6 | 2 | 11 | 2 | 2 | 3 | 48 | |
| 4. <u>Bec burinant</u> | | | 1 | | 1 | | | 1 | | | | 3 | |
| 5. Distally notched piece | | | | | 1 | 2 | 1 | | | | | 4 | 76 |
| <u>Retouched pieces</u>: | | | | | | | | | | | | | |
| 1. Inverse | | | | 1 | 1 | 1 | | 1 | | 1 | | 5 | |
| 2. Abrupt alternate retouch | | | | | 2 | 1 | 1 | 1 | | | | 5 | |
| 3. Fine abrupt retouch | | | 1 | | 4 | | | | | 2 | 1 | 8 | |
| 4. Bifacial retouch | | | | | 1 | | | 1 | 1 | 1 | | 4 | 22 |
| <u>Divers</u>: | | | | | 1 | | | 1 | | 3 | | 5 | 5 |
| Tool totals | 50 | 26 | 67 | 26 | 198 | 68 | 19 | 178 | 76 | 171 | 70 | 949 | 949 |
| Unretouched non-Levallois flakes | 14 | 6 | 7 | 5 | 27 | 9 | 3 | 17 | 13 | 13 | 10 | 124 | |
| Unretouched non-Levallois blades and points | [illegible] | 7 | 1 | 1 | 6 | 1 | 1 | 4 | 3 | 8 | 4 | 42 | |
| Fragments | 2 | | | | 3 | 1 | 2 | 3 | | | | 11 | |
| Cores | 11 | 9 | 6 | 3 | 11 | 7 | 2 | 22 | 7 | 12 | 4 | 94 | 271 |
| Grand totals | 83 | 48 | 81 | 35 | 245 | 86 | 27 | 224 | 99 | 204 | 88 | 1220 | 1220 |

Table C.3. Typological analysis of eleven layers in Level C.

ILLUSTRATIONS

These are prefixed with capital letter C (for Level C). Separate numbering is used for Plates (flint drawings), Tables and Figures. Sketches of additional flints from the Beirut collection (with schematic shading) occur as Figs.C.12 - C.18.

THE ARCHAEOLOGICAL MATERIAL OF LEVEL C

1. RAW MATERIAL

Various different kinds of flint and chert were used, as follows:

| | Number of pieces | Percentage |
|---|---|---|
| Brown flint (beige to chocolate tones; glossy) | 585 | 55.5 |
| Nummulitic cherty flint (honey-coloured, coarse) | 140 | 13.3 |
| Skewbald flint (brown/chocolate and white; matt to glossy) | 98 | 9.3 |
| Silicious limestone (grey, coarse) | 9 | 0.8 |
| Blue-grey Jurassic (poor quality) | 5 | 0.5 |
| Black flint (glossy) | 3 | 0.3 |
| Undetermined: burned to black or grey | 25* | 2.4 |
| Undetermined: white (patinated or desilicified) | 188 | 17.9 |
| Total | 1,053 | 100.0 |

* minimum (other fragments discarded).

Similar proportions of these varieties occurred in each of the excavation units; three examples are tabulated (Table C.4).

Only in 94 cases could the nature of the original nodule be determined. In 50% of these, the artifacts had been made on rounded pebbles or cobbles, some of which were fairly flat. Another 24% consisted of pieces made from tabular nodules with a thick chalky cortex on both flat surfaces; their thickness varied from c. 1.4cm. to c. 3cm. Only 17% appeared to have been made on irregular bedrock nodules, and the origin of the remainder could not be determined. The source of the cobbles was perhaps the series of fossil, or raised beaches occurring around and even inside the cave. The gravel deposits at the mouth of the Litani river (Fig.H.3), 6km. to the south, is an alternative source (Emery & George, 1963). The tabular and Nummulitic flint could have derived from the local Eocene bedrock. The black and blue-grey types must have been brought to the site from further afield.

2. CONDITION

Most artifacts have fresh, sharp edges, although those from Trench M seem slightly more battered. Six are definitely abraded, and 31 have two patinas. At least 50 pieces have been badly burned, and others have been subjected to heating, evidenced by thermal fractures or greasy shine. Burned pieces are more common in Trench D, which had a minimum of 12% of burned flakes, many more calcined

| Layer and artifact count | Flint: Brown/beige | Nummulitic | Skewbald | White, desilicified | Other kinds of flint or stone | |
|---|---|---|---|---|---|---|
| M152 (76) | 50.0% | 13.2% | 6.7% | 27.5% | 2.6% | 100.0% |
| G48 (205) | 55.2% | 12.2% | 7.8% | 14.6% | 10.2% | 100.0% |
| D255 (182) | 51.0% | 17.6% | 7.7% | 17.6% | 6.0% | 99.9% |

Table C.4. Percentages of different kinds of raw material used for artifact manufacture in three layers of Level C, chosen to represent front, central and rear areas of the cave.

fragments having been discarded after the first sorting, while Trench G had 6%, and Trench M 3% burned flakes.

Many pieces are heavily concreted, and some have as many as three different kinds of material (soil, gravel, calcrete etc.) adhering to their surfaces. Fifty pieces, mainly from Trench G, have become completely desilicified.

3. CORES (94)

As can be seen from Table C.2, each layer or unit with a good sample has a fair number of each kind of core. All stages of use from 'unstruck' to 'exhausted' are represented, the latter predominating. In their present worked-down state, none could have produced the larger flakes as plotted in Figs.C.3 and C.4 (the largest core is shown on Plate C.2, no.3). Of the 70 specimens with clear orientation, about two-thirds are roughly square in plan, with length/width ratios falling between 0.85 and 1.15. The other third consists of more elongated cores, most of which seem to have been the prismatic type for blades, confirming blade forms as being a definite component of the assemblages. As to thickness, most cores are broadly twice as wide as they are thick, the main peak of the curve falling at 0.5 (Figs.C.1 and C.2).

CORES WITH PERMANENT STRIKING-PLATFORM (47)

a. LEVALLOIS CORES, 23 (Plates C.23, no.13; C.26, no.5; C.2, no.3; Fig.C.13, nos.1 & 4)

There are eight of the classic type, with multiconvergent preparation and single platform, and 15 of the one-axis (or unidirectionally prepared) type, from which perhaps more than one flake was struck from the same striking-platform, or (as in 6 cases) from a second, directly opposed striking-platform. The one-axis types are generally smaller than the classic specimens, have only minor side and back preparation, and usually have faceted striking-platforms; however, plain platforms do occur (Table C.4b) even on the rare point cores, of which there are six specimens. One of the Levalloisian cores of classic type may be unstruck (Plate C.2, no.3); another gave an atypically broad Levallois flake. On one core (Fig.C.13, no.4) both kinds of preparation occur, Levallois radial on one face, summary one-axis on the other.

b. PRISMATIC CORES, 19 (Plates C.25, no.11; C.26, nos.2 & 3; Fig.C.13, no.3)

Eleven are the 'Acheulean orthogonal' type (see Copeland and Hours, in Sanlaville, 1979, p.33), the products being struck off along the long axis of the pebble, from a single platform (on the thickest part of the diameter) which has often been formed by splitting the pebble across its waist. Plain platforms predominate. At least eight are bipolar cores, i.e. having opposed platforms. Plate C.25, no.11 and Fig.C.13, no.3 show two of the medium sized blade-cores in this group, and Plate C.26, no.3 shows a smaller, Amudian-like specimen (one of five similar pieces) from which small blades have been struck from a refreshed platform; two of the smaller blade-cores resemble Upper Palaeolithic pyramidal cores.

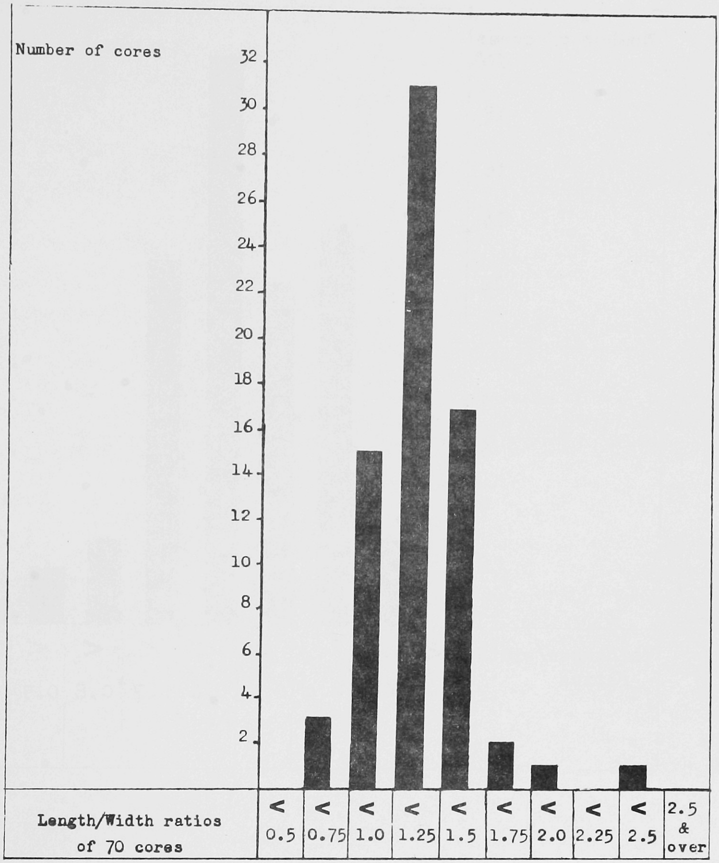



Fig.C.1 Length/width ratios of 70 cores from Level C. Compare with Level B cores, Fig.B.2.

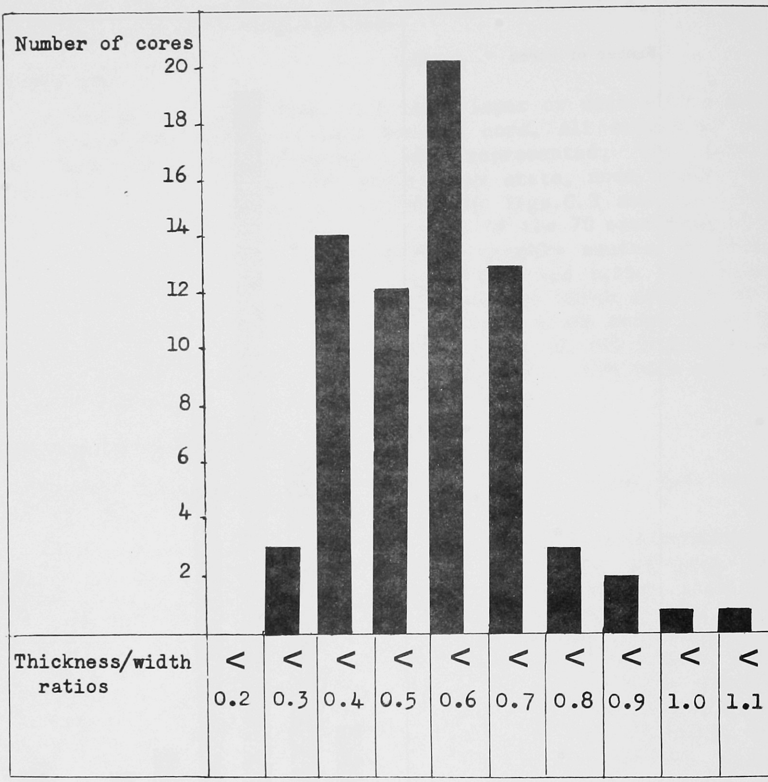



Fig.C.2. Thickness/width ratios of 69 cores in Level C. Compare with Level B cores (Fig.B.3).

The remaining prismatic cores were made on tabular slabs, all but one with plain platforms. The angle between the platform and the flaking-surface is slightly less than 90°; hence, flakes struck from these cores would not have a high-angle butt.

c. DOUBLE OR 'BACK-TO-BACK' CORES, 5 (Plate C.26, no.4)

The illustrated piece has a flake core on one face and a prismatic blade core, flaked on a different axis, on the other. This kind of core was noted by Garrod, for example at Mount Carmel (Garrod and Bate, 1937); Solecki and Solecki illustrate one from Yabroud I (1966, Fig.14, no.3) and Neuville describes one from Oumm Qatafa as à préparation globuleuse, à revers prismatique (1951, p.83 and fig.38, no.11).

CORES WITH NON-PERMANENT STRIKING-PLATFORM (34)

a. DISCOID, 23 (Plate C.25, no.12)

Exhausted (worked out) cores form 24.5% of the cores in Level C. They are generally small (Figs.C.1 and C.2), with the upper surface showing radial or bi-directional removals. As with Mousterian discoid cores, the periphery, which represents multiple platforms, is often irregular and jagged, but the Level C specimens seem thicker than the core-bases characteristic of Levalloiso-Mousterian industries.

b. CONICAL CORES, 11 (Plate C.26, no.1)

These are discoid in plan, with flakes struck off from the periphery towards the apex of the cone or cones, alternately on each face, the scar of one removal forming the striking-platform for the next blow. The cores in this group have been rather roughly flaked, some pieces being globular with extremely sinuous peripheral ridges. We should also note that conical cores, whether they have a complete or only a partial peripheral ridge, are difficult to distinguish from discoid chopping-tools (type IV of Hugot; see Brézillon, 1968, p.226) and clear-cut criteria do not exist as yet. Some classifiers prefer to class all such pieces as cores (e.g. Skinner, 1970).

OTHER CORES, 14

Nine are broken or re-worked, classed as 'amorphous' or 'divers', while four are fragments - parts of larger cores.

GENERAL COMMENTS ON THE CORES

No examples of a common Middle Acheulean core-type, with polyhedric faceting and 'wandering' ridges, were present. All layers have similar cores, common traits being: variety of type; number of intermediate forms; scarcity of classic Levallois forms (eight specimens in all); broadly equal frequency of prismatic, summary Levallois (particularly the 'unipolar for blades' type) and discoid types. A similarly low percentage of classic Levallois types was noted by Skinner (ibid.) at the Yabrudian site of Masloukh.

## 4. PRODUCTS (FLAKES AND BLADES)

The technical aspects of all flakes and blades in Level C, whether retouched into tools or not, are considered here. As Fig.C.4 shows, non-Levallois flakes predominate, but a few Levallois pieces occur throughout the layers, blades outnumbering flakes. Plain and cortex butts are the most common butt types in all layers, but they would be outnumbered if flakes without butt and with butt removed by retouch were amalgamated. Fig.C.4 may be compared to Fig.B.4, in Section III, which shows that faceted butts predominate in the Levalloiso-Mousterian level, B.

In Fig.C.3, the multiple peaks imply that a variety of knapping techniques were employed by the occupants of Bezez C. In classic typological terms, these range from Clactonian-like to Levallois. The Clactonian types, which have wide-angled butt, pronounced bulb, or bulbs, and cones of percussion, were presumably struck off by unsophisticated methods; they are often massive and have high flaking angles (up to 140°) between the butt and the ventral surface. Many are wider than long, and have a convex flake-surface, which allows them to rock from edge to edge ('rocking-chair' type; see p.126). Most of these are cortex-flakes or have cortex butts (Plates C.15, no.1; C.20, no.5; C.22, no.5). Then there are flakes which were evidently struck off by stone hammer from held or supported cores, but they, too, often have multiple bulbs and show pronounced shock-waves. Some may have split longitudinally (Plate C.17, no.1) in the manner of _"burins" de Siret_ (Brézillon, 1968, p.181). Other categories are: core-trimming flakes (Plate C.23, no.6; C.22, no.1); non-Levallois flakes from discoidal cores; flakes from partially prepared cores; Levallois flakes. A small but distinctive group of para-Levallois transverse flakes (e.g. Fig.C.18, no.1) with upper surface preparation and pointed extremity have been struck from cores comparable to Biberson's _type ancien de nucleus préparé_ (1961, p.450, Figs.44-46).

At the other end of the scale is a lighter element, technically the same as Abri Zumoffen's Amudian material (see Section II below) or some of the Bezez Level B Levalloiso-Mousterian pieces (Section III below); see Plates C.13 and C.24. These were evidently struck from cores prepared, extensively or summarily, by the Levallois method, using a light hammer. In these the butt/ventral surface angles are usually nearer the right angle, and in this they resemble the majority of Level B pieces.

All three types of flake have been used for tool-making; flakes were also used to fashion bifaces and cores (Group B.6 on Table C.2). Group B.7 on this Table are the Janus and Kombewa flakes (flakes with two bulbs; these occur either on each extremity or on both surfaces of one extremity (de Heinzelin, 1962, p.13; and Brézillon, 1968, p.98).

At least eleven of the by-products (Group C) are considered to be flakes produced during the final trimming of bifaces (_éclats taille de biface_); they have plain lipped or linear butts or shattered butts and all are of moderate size. (N.B. Group C.4 are

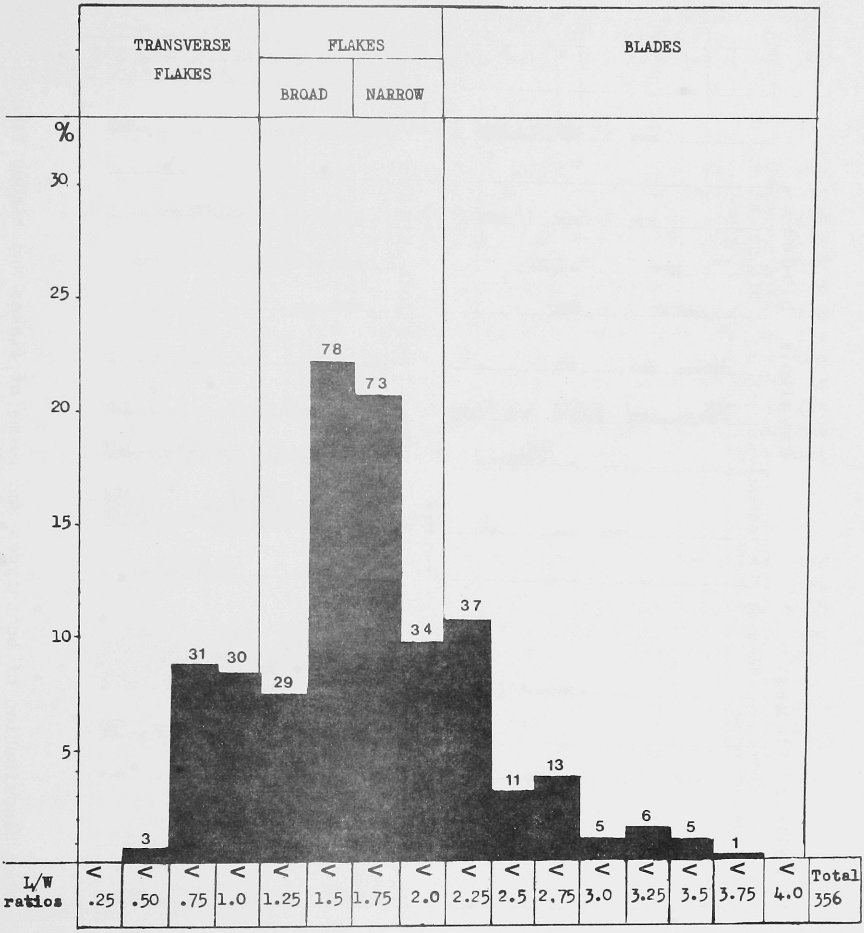



Fig.C.3. Analysis of the length/width ratios of 356 flakes and blades from Level C, grouped with a cell interval of 0.25. The sample consists of unretouched and slightly retouched pieces. The apparent polymodal curve suggests that more than one 'population' of flakes may be present. Contrast with the unimodal curve in Level B, in Fig.B.7.

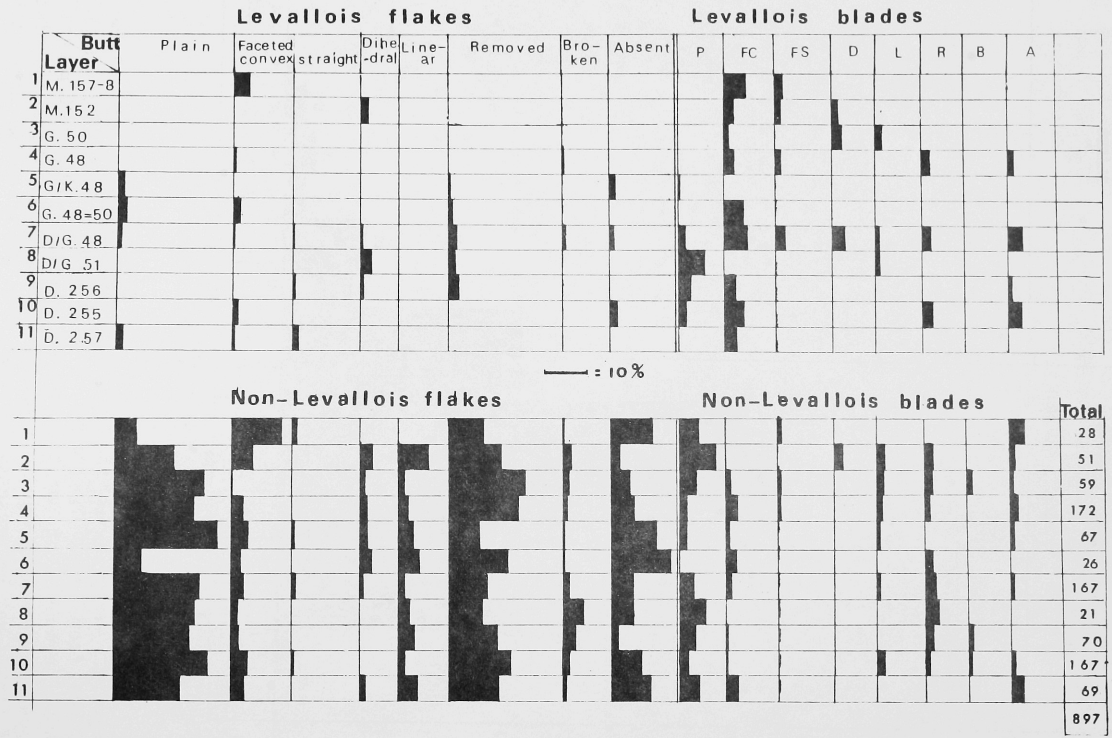



Fig.C.4. Histograms showing distribution of butt-types and forms of flakes and blades from 11 layers in Level C. 897 observations.

flakes struck from already-formed bifaces, and hence are described with the bifaces (Plate C.11, nos.2-5).)

The dimensions of the flakes and blades of the Cambridge collection were recorded on an interval scale in centimetres, but the Beirut pieces were rated on a nominal scale of "small" (under 4cm. long), "medium" (4-8cm. long) or "large" (over 8cm. long). Figures C.2, C.3, C.4 and C.5 are based on artifacts in the Cambridge collection.

## LENGTH AND WIDTH OF THE PRODUCTS

In their present condition, the length frequencies of the flakes form a normal curve with a peak at 7 - 8cm. However, only in the case of 78 out of a total of 341 pieces was the length complete; this was largely due to the high number of pieces with butt removed or reduced (Fig.C.4). The longest of the unretouched blades (13.4 x 4.0 x 1.0cm.) was Levallois, from M.157. Compared with the Level B flakes (Fig.B.7), those in Level C (Fig.C.3) are more often transverse, i.e. broader than long, when measured on the axis of the removal blow. Blades form a much smaller part of the industry. There are also more broad flakes than were produced in Level B. Besides being rare, the blades of Level C are fairly broad, and the longer blades of Level B are absent. These features would be distinct enough to form several peaks on a frequency curve.

## THICKNESS

The thickness of the flakes and blades, as well as the proportion of deliberately-thinned pieces is shown in Fig.C.6; out of a total of 328 flakes, two-thirds (233 pieces) had complete bulb and butt while the thickness of 95 had been modified. The curve has a skew towards massive and thick-butted pieces. Roughly 50% of this group have had their butts thinned. Pieces in the 1 - 1.75cm. medium thickness ranges however are more numerous and less often thinned. An entirely different thickness was preferred by the Levalloiso-Mousterians of Level B as is also shown on Fig.C.6; nevertheless, some flakes just as thin as those commonest in Level B were present in Level C.

## BUTT ANGLES

The butt angles on many flakes could be measured only approximately, because of either breakage, secondary retouch, or the pronounced nature of the bulb. The peak of the 133 measurable pieces comes in the 120° range, in contrast to the modes of Level B at 100° and Abri Zumoffen at 110°; see Figs.C.5 and Z.2 (p.223).

## GENERAL COMMENTS ON THE FLAKES

The same kinds of flakes occur in Abri Zumoffen and in contemporary or earlier levels at sites along the coast (Masloukh, Tabun, Ras Beirut); they clearly derived from the local Late Acheulean traditions, but the frequency of butt-thinning and the presence of a few Levallois flakes indicate that the old traditions were changing. On the other hand, there was evidently still a need

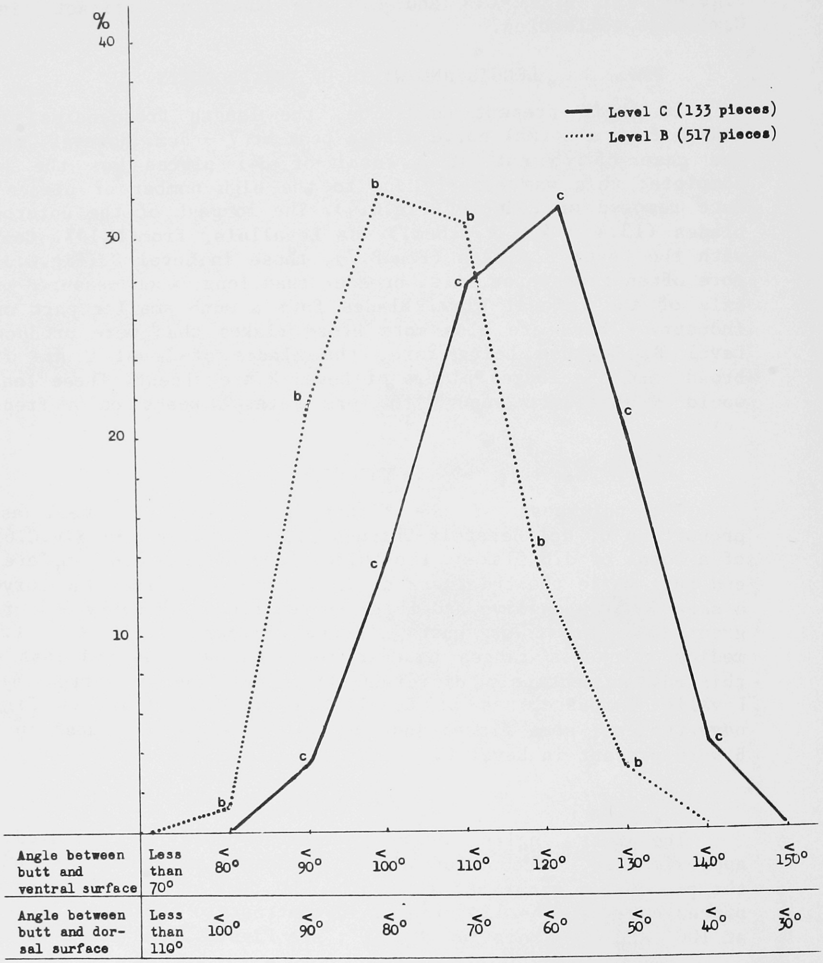



Fig.C.5. Comparison of the butt-angles of 133 flakes of level C with the butt-angles of 517 flakes from Level B. (Note: in the case of Level B, the complementary angle (between the butt and the dorsal surface) was the one measured.)

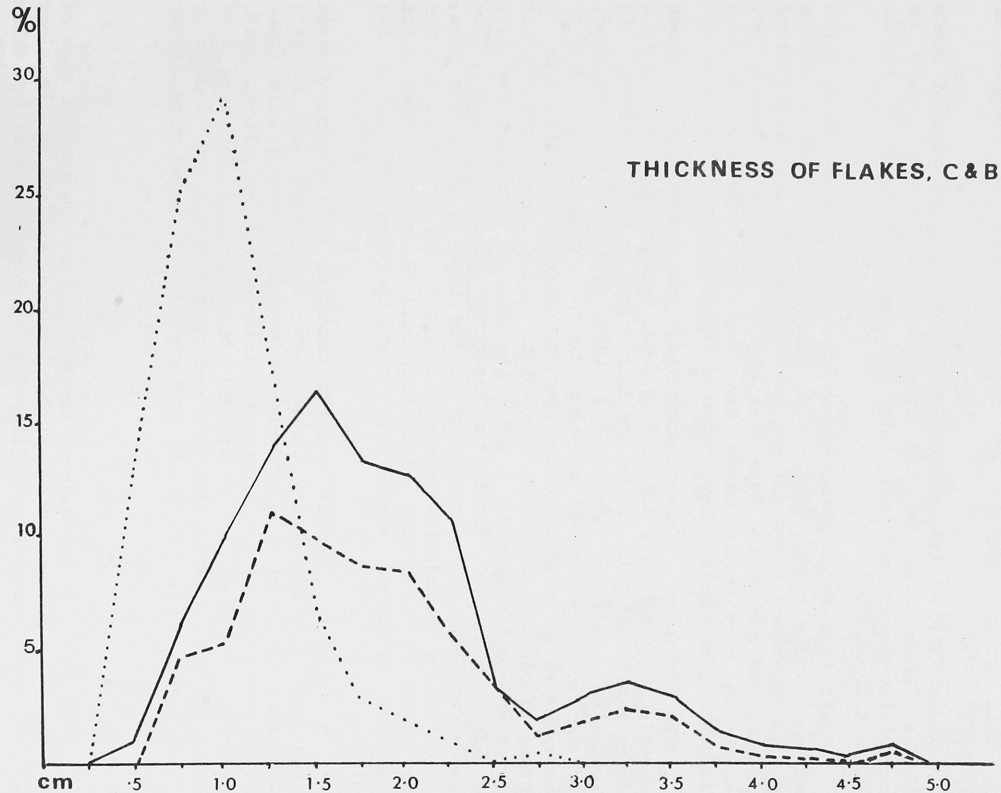



Fig.C.6. Comparison of the absolute thickness of 328 flakes in Level C with that of 625 flakes in Level B, expressed as percentages. Solid line: all the Level C flakes in the sample of 328; dashed line: 233 complete Level C flakes (the space between the solid and dashed lines corresponds directly to the percentage of thinned flakes (95 in all) in each cell); dotted line: the Level B sample of 625 flakes.

for flakes more robust than could be produced by the use of light hammers.

With the material amalgamated, the Levallois index is 12.5 and the Restricted Facetting index is 15.2; for individual layer scores, see Table C.8.

## DESCRIPTION OF THE TOOLS.

### A. PEBBLE TOOLS (43)

This group consists of four varieties of chopper or chopping-tool.

About half of the chopping-tools are made on rounded beach pebbles (Plate C.1) and the other half on tabular slabs or irregularly-shaped nodules; only six are made on heavy flakes (Plate C.2, no.2).

Apart from seven pieces which have been made on older cores and have double patina (Plate C.2, nos.1 and 3), these artifacts have fresh, sharp edges and are unpatinated. Six are desilicified and they and six others have what appear to be 'utilised' edges, though no microscopic study has been made to confirm this diagnosis. The majority have retained the globular cortex butt.

The dimensions of the chopping-tools are moderate, the largest measuring 13.7 x 17.8 x 5.9cm. (Fig.C.14, no.3; this piece may be a biface rough-out); the others are fairly small. In classifying this group, the example of Tixier (1956; 1960, p.14) has been followed, and the tools are divided according to the scheme of H.-J. Hugot: our choppers correspond to his type 1, where the cutting edge is formed of one or more facets opposed to cortex. The chopping-tools correspond to his type 3, in which the edge is formed of two sets of opposing facets (forming a tranchant sinueux partiel). The discoid chopping-tools correspond to his type 4, where the edge, without being secondarily retouched, extends all or almost all the way around the periphery. Plate C.2, no.1 shows a specimen which has been retouched almost all over, perhaps to reduce the thickness.

In spite of the difficulties noted on p.92 above, discoid cores and discoid chopping-tools are recognised as separate categories in Level C. Most authors who have worked with these artifacts recognise two distinct classes (see Brézillon, 1968, pp.79-96, 194, 224-27). The discoid chopping-tools form type 4 of Tixier (1956), and were distinguished from cores by the absence of striking-platforms, and by the acute angles of convergence of the edge-forming facets.

### CHOPPERS, 4

Three of these are made on re-used flakes; one lateral side of each has also been retouched on the inverse surface of the older flake, forming jagged edges. Plate C.2, no.2 shows a specimen which may have been part of a discoid core.

CHOPPING-TOOLS, 32 (Plate C.1, nos.1-3; Fig.C.14, no.1)

Fig.C.14, no.1 shows one example of a typical group where the chopping edges are usually convex in plan and sinuous in section. Broadly pointed, straight or concave chopping-edges are in the minority, as are cases where the chopping-edge is continued far enough around the piece to form an L or a U. The latter grade into the discoid type. Three pieces resemble Tabun F types (see further comments below).

INVERSE CHOPPING-TOOLS, 2

On one of these the edge is formed of facets opposed to a natural cleavage surface. On the other, new retouch is opposed to the flake-surface of an older piece.

DISCOID CHOPPING-TOOLS, 5 (Plate C.2, no.1; Fig.C.14, no.3)

One is made on a flake with two patinas, the others on pebbles. In only one specimen (Fig.C.14, no.3) is the ridge continuous around the whole periphery; on the others there is some irregularity. In two cases this has been corrected by fine retouch to form a neat bifacial edge.

GENERAL COMMENTS ON THE PEBBLE TOOL GROUP

On the whole this is a very evolved group; exceptions are the few true pebble-tools (Plate C.1, nos.1-3; Fig.C.14, no.1). On the more refined pieces the retouch has either made a bifacial edge around the circumference of the piece or part of it, or has removed most of the cortex by polyhedric faceting (Plate C.2, no.1). Out of the 42 pieces considered here, only two resemble the distinctive type of chopping-tool seen in Levels F and Ed at Tabun, carefully made with neat secondary retouch on the chopping-edge; this type grades at Tabun into Garrod's short 'square-ended bifaces' (the bifacial cleavers of Gilead, 1970).

B(i). BIFACES (142)

The raw material seems to have been chosen impartially to make any category of biface; 60 are on buff flint, 24 on fossiliferous Nummulitic chert, 13 on skewbald flint, three on silicious limestone, and 17 are partly desilicified. Their condition is generally fresh; however, eleven are completely desilicified, another five are clearly abraded and at least three have been burned. Sixteen have very battered edges. Twenty bifaces were made on beach cobbles, 20 on heavy flakes, 13 on tabular slabs and 13 on potato-shaped nodules; the remainder are without cortex.

The bifaces are classified as set out in Table C.5; this scheme (only applicable to Bezez C) is a modification of Bordes' method (1961). It takes into account earlier work done in the Near East, especially that of Garrod and Bate at Tabun (1937, p.81).

Although the biface categories were determined by conventional methods, i.e. according to outline in plan, additional attribute analyses were carried out on complete specimens (Figs.C.7 - C.9). Some difficulty was experienced with 36 pieces, which seemed to be

| Position of greatest width in plan | Outline formed by the sides in plan | Distinguishing feature | Category |
|---|---|---|---|
| Widest at mid-section | Circular (L/m = 1.3) | Thin (m/e up to 2.35)<br>Thick (m/e 2.35 or more) | Discoid<br>Nucleiform |
| | Biconvex | Regular<br>Irregular<br>Elongated (L/m over 1.6)<br>Bipointed | Ovate<br>Sub-ovate<br>Limande<br>Naviform |
| Widest mid-way between mid-section and base | Biconvex | Short (L/m less than 1.5), and thick (m/e 2.35 or more) | Pyriform |
| | | Long (L/m over 1.5), and thick (m/e 2.35 or more) | Amygdaloid |
| | | Short (L/m less than 1.5), and thin (m/e up to 2.35) | Cordiform |
| | | Long (L/m over 1.5), and thin (m/e up to 2.35) | Elongated cordiform |
| | | Irregular, thin | Subcordiform |
| | Straight from mid-section to tip | Straight sided, thick | Lanceolate |
| | Concave and tapering, mid-section to tip | Thick, with concave sides tapering to a point | Micoquian |
| Widest near base | Slightly convex, or base slightly rounded | i) As in column 2<br>ii) irregular triangular | Subtriangular |
| Widest at base | Straight | Straight sides, widest at base | Triangular |
| Any position | Any of the oval-to-triangular forms | i) Having large unmodified areas, e.g. flake-surface or cortex<br>ii) Cortex left on greater part of one cutting-edge | Partial |
| Any position | One lateral edge of any form, the other replaced by an abruptly retouched back | Asymmetrical section, and reduced length of cutting-edge on the side backed by retouch | Backed |
| Any position | Any form | Unclassifiable as above or reworked etc. | Divers |
| Any position | Any form | Portions of larger bifaces, including large refreshment-flakes from already-formed bifaces | Fragments |

Table C.5. Principles followed in the classification of Level C bifaces. After the method of F. Bordes (1961), except for categories 'Pyriform' and 'Sub-ovate', and slightly different definitions of 'Partial' and 'Backed' bifaces.

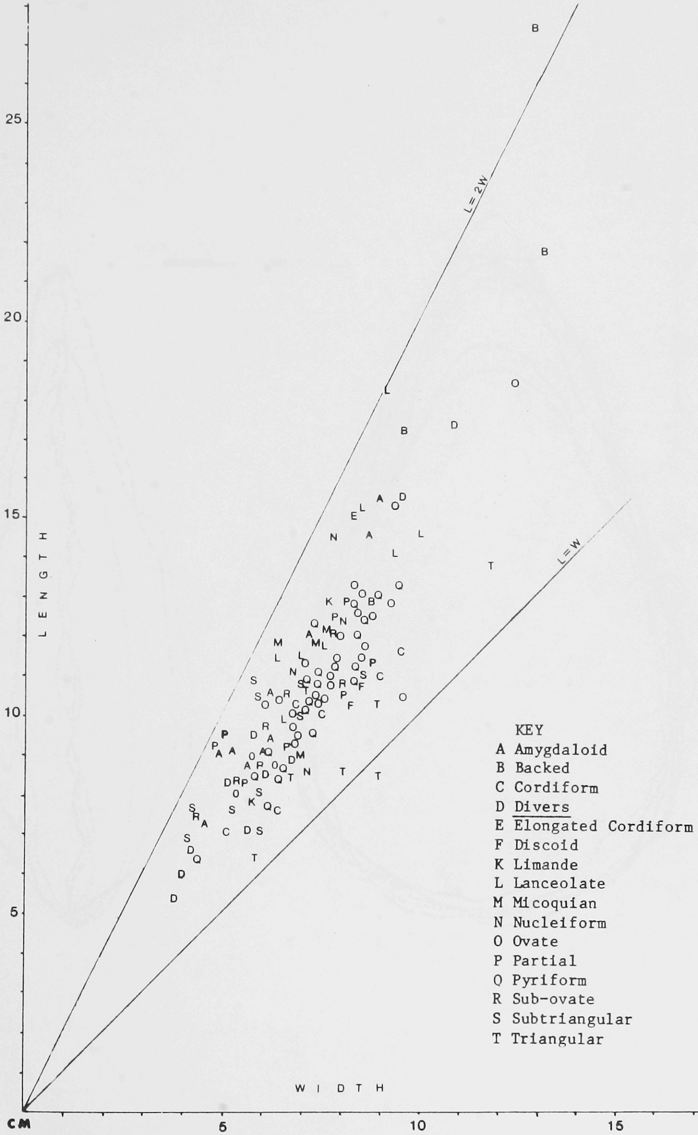



Fig.C.7. Length/width distribution of 132 bifaces from Level C, by categories.

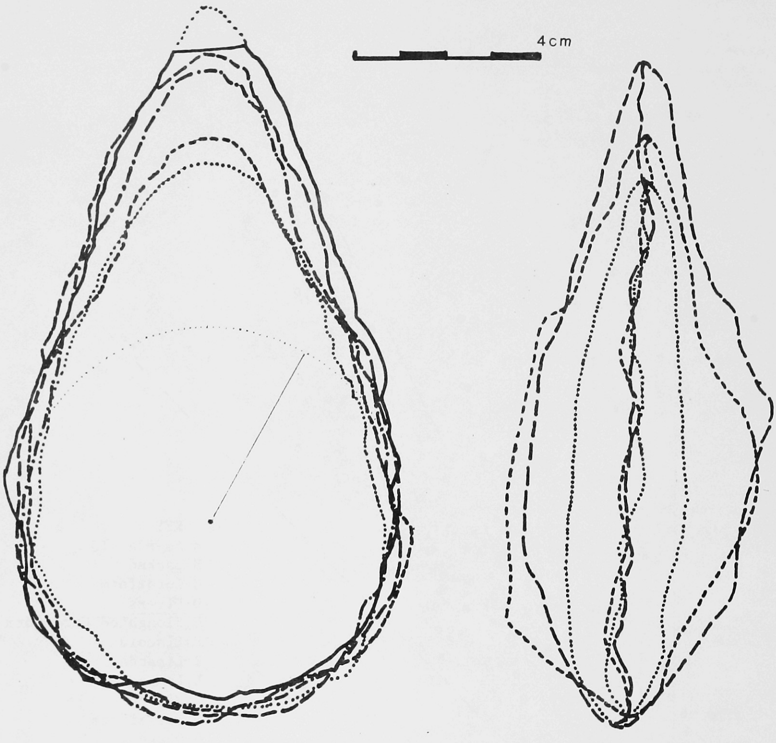



Fig.C.8. Comparison of the outlines and profiles of one cordiform and four amygdaloid bifaces from Level C, Layer D/G48. Their bases form segments of a circle radius 42 - 44mm.

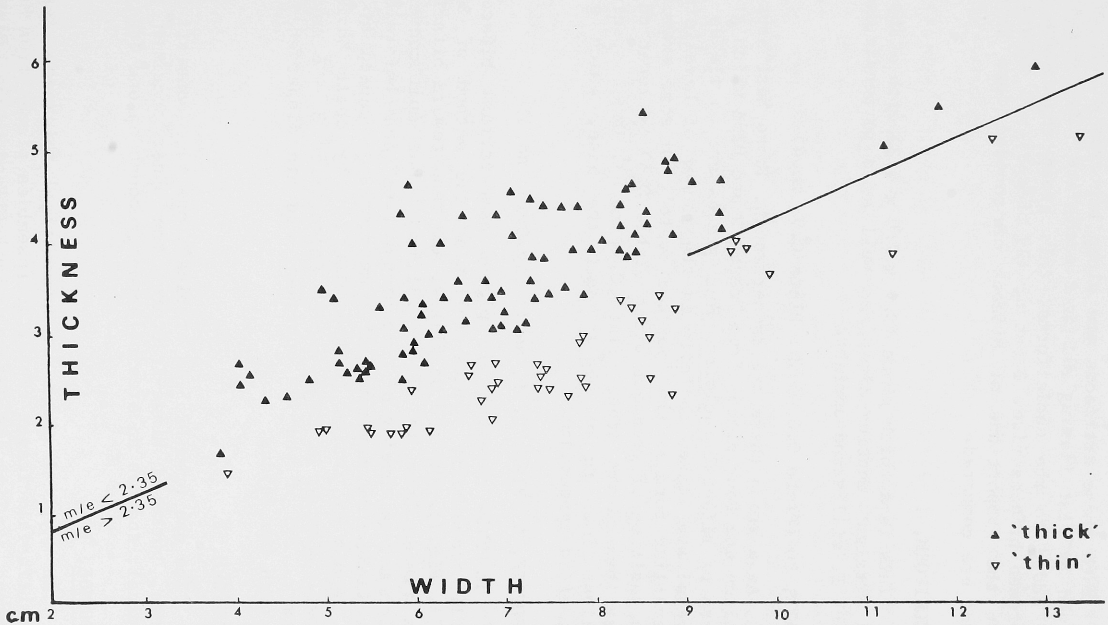



Fig.C.9. Scatter diagram to show distribution of thickness and width in 128 bifaces of Level C.

intermediate between bifaces and bifacial racloirs. Eventually nine were taken to be bifaces and the others to be racloirs (Fig.C.16, nos.1 and 2).

DISCOID BIFACES, 2 (Plate C.8, no.4)

Both these artifacts are plump biconvex pieces of buff flint shaped by flat flaking all over each face. If the discoid bifaces are added to the nucleiforms, this group represents 2.3% of the unbroken bifaces (i.e. 3 out of 129 pieces) - a figure of interest when the proportions of bifaces of rounded form from Tabun and Bezez are compared.

NUCLEIFORM, 1

This is a thick piece (8.4 x 7.0 x 4.3) with a sharp, flat tip and straight cutting-edges, as well as a perpendicular base upon which it will stand upright.

OVATE, 20 (Plate C.6, no.1; Plate C.9, no.4)

As a group these are rather rough. Those best approaching oval outline are four pieces from Trench G and D256 which grade into the class of bifacial racloirs. Four pieces are on flakes (Plate C.1). Several are flaked radially in the manner of Levallois cores. The prevailing form is the 'pointed ovate', in some examples of which the position of greatest width (Table C.5) is lower on one lateral edge than on the other (Plate C.9, no.4). Other specimens have an oblique fracture or méplat near the base, which gives them a lop-sided appearance.

SUBOVATE, 9 (Plate C.11, no.1; Fig.C.15, no.3)

In this category are placed asymmetrical bifaces which are still technically ovates following the method of Bordes (1961, p.54, Fig.7). Two are on flakes, and tend toward bifacial racloirs. The piece shown in Plate C.11, no.1 has multiconvergent facets which may be remains of core-preparation, done before detachment of the flake. The asymmetry of some pieces is caused by the presence of géodes or faults in the flint or by their having lop-sided bases. Bifaces of oval aspect (categories 3 - 6 taken together) form c. 26% of the 129 unbroken, and are dispersed fairly evenly through the layers.

NAVIFORM, 2

The one from D255 is atypical, one face consisting mainly of a large, puckered hinge-fracture; the other specimen is small but typical, and has an area of abrupt retouch on one edge.

LIMANDE, 1

An atypical piece, of asymmetrical thickness, tending towards the bifacial cleaver class. It resembles pieces from Ma'ayan Barukh classed as limandes (Stekelis and Gilead, 1966, Plate XVIII); it may originally have been an ovate.

AMYGDALOID, 10 (Plate C.7, no.2)

Short amygdaloids have been separately classified as 'pyriform bifaces' (see below). This group therefore consist of amygdaloids with L/m of more than 1.5 (for explanation of this measurement and the others on Table C.5, see F. Bordes, 1961, pp.62, 81). The amygdaloids seem to cluster in the layers of Trench G. In contrast to the ovate group, they are generally large, well-made pieces with bold flaking. Some have bases retouched to form a 'perfect semi-circle' (Plate C.7, no.2 and Fig.C.8), but others have V-shaped bases or cortex bases. Secondary retouch at the edges is often alternate. Only one example is made on a flake.

PYRIFORM, 20 (Plates C.7, no.1; C.8, no.1; C.10, no.1)

Short, thick amygdaloids form a distinctive group and have been placed in this separate category. The distinction may be thought rather arbitrary, since the distribution of the L/m within the amygdaloid group forms a normal curve with a peak at around 1.4. 'Piriform' was the name applied by Neuville at Qatafa to a short, thick biface of cordiform outline, having a thin and sharp tip (e.g. his Fig.15, 7 on p.57, 1951). It also refers to the term 'pear-shaped' used by Garrod and Bate at Mount Carmel, and corresponds broadly to the amygdaloid court type of Bordes (1961). Six specimens are on flakes, and all but one of these (from M152) are from Trench G. The drawn piece, Plate C.7, no.1, is at the upper limit, with its L/m at 1.48. The pyriforms are characterised by the contrast (accentuated by their shortness) between the thinness of the tip and the thickness of the base (Plate C.10, no.1), or the body (Plate C.8, no.1), which is variable in form and shape. Three have bases retouched to a 'perfect semi-circle'.

CORDIFORM (6) AND SUBCORDIFORM (2), total 8 (Plate C.10, nos.2 and 5)

The small drawn piece from G50 resembles a foliate point; it has very fresh edges in mint condition. One specimen from G48 is made on a flake; the flake-surface required retouch only on one edge and under the tip. Another is naturally thin, the blank being a flat pebble. The smallest cordiform biface is shown on Plate C.10, no.2; the presence of a géode has caused the deformation of part of one edge.

The subcordiforms are of the truncated base type, one with flat, centripetal retouch over bold primary flaking. One has an oblique stand-up base formed of a cleavage surafce; the other is coarsely flaked, but its perpendicular base is formed partly of cortex and partly of rough faceting.

In Level C, bifaces of cordiform aspect (categories 7 - 10 taken together) form 31.0% of the unbroken bifaces.

ELONGATED CORDIFORM, 2 (Plate C.8, no.3)

The drawn piece is well made, on a flat pebble (m/e = 2.6) of glossy brown flint. It has straight edges and a tranchet-like tip. The other piece is also well-made, with a 'perfect semi-circle' base and careful, all-over flaking.

LANCEOLATE, 9 (Plate C.6, no.2; Plate C.8, no.2; Fig.C.15, no.1)

Only three of the straight-sided bifaces are typical; they are long, with coarse flaking except at the edges, which have fine, straight retouch. The others have bold or irregular flaking. In one specimen, a single facet covers almost the whole of one face. Plate C.6, no.2 shows an atypical example with partial cortex back; it tends, as do several others, towards the amygdaloid form. Two pieces are made on flakes (Fig.C.15, no.1) and one has a re-worked tip which includes a possible burin-blow, in the form of a facet struck off obliquely down one lateral edge from the tip. As a group, the lanceolates are not especially distinctive, and seem to grade into other categories such as partial and subtriangular (Plate C.10, no.4; Plate C.9, no.2); this category might be considered as a variant of bifaces of cordiform aspect.

MICOQUIAN, 2 (Plate C.9, no.1)

Both examples lack the tip. In one case, the break has been reworked; this piece is made on a flake. The other specimen has a butt retouched into a 'perfect semi-circle'.

Three more Micoquian bifaces with accuminate tips and concave sides were found in Trench K, layer 14 (a disturbed layer, but possibly a continuation of G48). Two of these are complete, while the tip is missing in the third. One has a 'perfect semi-circle' base and two are on flakes with the butt partly removed (Plate C.9, no.1).

In section, the tip on the Micoquian pieces is triangular in one case, lozengic on three and concavo-convex on the fifth; all the distal extremities are thick rather than flat, and no specimen seems to resemble the very sharply pointed Micoquian bifaces from Tabun Ec, whose extremities are chisel-like and flat.

TRIANGULAR, 6

Only one specimen resembles French types; it is an isosceles triangle from G48 which has a third cutting-edge at the base; however, it is very thick (4.1cm.), with plump biconvex profile. Two other pieces are ogivo-triangular, similar to the piece shown in Fig.C.15, no.2. One has a cortex base, reminiscent of a piece from Pech de l'Azé I b (Bordes, 1954, p.424, Fig.16, 3). Another has a stand-up base formed of a cleavage surface (*biface triangulaire à talon ou méplat* of Bordes, 1961, p.59). Two others are apparently the tips of once larger bifaces, remade by secondary retouch; on one the base is formed of two converging fractures (*méplats*), and on the other the break has been left to form the base of a piece only 1.9cm. thick.

SUBTRIANGULAR, 12 (Plates C.9, no.2; C.10, no.3; Figs.C.15, no.2; C.16, no.1)

This group consists of pieces which are widest close to the base, but which also have convexity at the sides, as in the *ogivo-triangulaires* of Bordes (1961, p.82) or at the base, or else show asymmetry, which precludes their classification as triangular. Five of these are made on flakes, with the butt and bulb partly removed

by invasive retouch. Two tend toward the class of offset bifacial racloirs (Fig.C.16, no.1), with the "rocking-chair" feature (see below, p.126).

Five pieces have irregularities, such as convexity of the lateral edges (Fig.C.15, no.2); an irregular projection at the base (Plate C.10, no.3); one straight, one convex lateral edge etc. Two others are unmeasurable through being broken or desilicified. In spite of the irregularity of the outline in plan, most specimens have careful centripetal and flat trimming over bolder p imary shaping facets.

Bifaces of broadly triangular aspect form c. 13% of the unbroken bifaces. The impression given by this group is that they, too, grade into the amygdaloid type.

PARTIAL BIFACES, 8 (Plate C.10, no.4)

The definitions applied to this category differ slightly from those of F. Bordes; see Table C.5. Only one (from M158) is made on a flake; the rest have large areas of unmodified cortex. Five tend toward bifacial racloirs, e.g. the piece on Plate C.10, no.4, which is classed as a biface because (even though one face has racloir retouch) both faces are formed by the invasive faceting of a nodule. Three specimens have an oval outline, one of which is a fragment from a larger piece; it is a bifacial point on a thin tabular slab. A typical piece (from D257) has a sharp, thin tip formed by a tranchet blow, and has cortex on the base, one side and on both faces.

BACKED BIFACES, 5 (Plates C.3 and C.4)

This term is used following the advice of Bordes (pers.comm., 1969, and see Brézillon, 1968, p.157), in preference to 'biface-racloirs'. All of these are large bifaces. The two drawn pieces may be rough-outs, but the tip is well-made on both and they conform to a 'type', almost bilateral specimens of which occur (although not as 'backed') in D/G51 and G48. This type of biface can be defined as partially-backed and thick, shaped by bold primary facets, with little secondary retouch. The tip is carefully-formed and slightly spatulate.

Three specimens are made on tabular slabs and one on a massive flake. Two have oval outlines, and the two faces and cutting-edges have been shaped by alternate retouch applied transversely to the axis of the piece; it is on such pieces that the abruptly retouched 'back' resembles the lateral retouch on cleavers. On the other pieces the back is fortuitously formed, either of fracture surfaces or cortex (Plates C.3 and C.4).

DIVERS, 13 (Plate C.9, no.3)

Four are bizarre forms, such as the 'tanged' amygdaloid on Plate C.9, no.3 (the "tang" actually consists of a cortex area with a géode); this piece has a kind of burin-blow (perhaps fortuitous) at the tip. A biface with a similar burin-blow is shown by Neuville (1951, Fig.18, no.6, p.42) from Qatafa D.

Seven are incomplete pieces, four of which are the tips of large bifaces reworked into another form. All have older patina and newer secondary flaking, and two have been burned; none has a retouched base, the base in each case being either missing or formed of fractures. Two pieces on nodules tend toward the bifacial racloirs class.

FRAGMENTS, 12 (Plate C.11, nos.2-5)

There are six specimens, four bases and two tips, which have been broken from larger bifaces; one has been reworked on the break to form an asymmetrical point. Another six specimens are flakes struck from bifaces. Either the entire tip (2 cases; Plate C.11, nos.2 and 4), part of the side (2 cases; Plate C.11, no.5) or part of the lateral cutting-edge (2 cases; Plate C.11, no.3) was carried away on the flake. Both the complete tips come from M152. Their similarity indicates that they were subjected to the same process (a blow on the cutting-edge), but whether this occurred accidentally during use, or whether it was done to refresh a battered edge, is not clear. The presence of these six pieces, the other fragments, and the biface preparation-flakes in Level C implies that bifaces were trimmed, used and repaired, actually inside the cave. The biface refreshment-flakes are closely comparable to those found at Yabrud I, level 5 by Rust (1950); see his Tafel 34, 1 - 4 (tips of bifaces); 6 - 8 (sides) and Tafel 36, 5 (the side of a biface, re-used as a tool?).

THE ATTRIBUTES OF THE LEVEL C BIFACES

Upon examination it was found that only obviously-related attributes (such as thinness with cordiforms, a single cutting-edge with backed bifaces), occurred in association with particular outline categories. Many other attributes (such as the length/width distribution) occurred at random, and unconnected with the outline categories (Fig.C.7). An effort was therefore made to find out what correlations existed between attributes, especially those which might give clues as to function or cultural tradition. In the absence of both wear analyses and established criteria for biface variables (how rounded is a 'rounded tip'?) the study was confined to the most simple and visible attributes of the tip, the cutting-edge, the base, the profile, the retouch and the dimensions, as well as to such traits as the incidence of the S-twist feature (cf. Roe, 1968). Comparative presence/absence tables were drawn up but it has not been thought worth reproducing them here since the numbers of specimens in each class was so low. Instead we may summarise the results, as follows:

1) Outline category has no connection with dimension or implement use, if the type of tip, base, cutting-edge, profile etc. are indicative of function.

2) Irrespective of size, the main part of the tool appears to be the tip, with the lateral edges next in importance, and with the butt the least important area.

3) Although both minute and quite large bifaces were produced, the most frequent goal of the knappers seems to have been the

production of a fairly short, thick piece, c. 8-13cm. long, with straight or slightly S-twisted cutting edges, and a sharp, flat tip, more often than not rounded; any retouch on the base was unlikely to form part of the working-edge. A typical piece would be an amygdaloid or an ovate, having a convex profile, a méplat interrupting one lateral edge, an S-twist on the other, and it would be about 9-11cm. long. To repeat - the outline categories and dimensions are quite randomly associated with these 'typical' traits.

To take some of these traits individually, the thickness and asymmetry of the bifaces in profile (Fig.C.9) set them apart from, for example, certain typically thin French biface groups. Thickness in fact seems to be a characteristic of Near Eastern bifaces as it occurs from Israel (Gilead, 1970) to Lattakiya (e.g. at Roudo: see Copeland and Hours, in Sanlaville, 1979; Copeland and Hours, 1979). The scarcity of triangular bifaces can be regarded as directly related to the general absence of basal retouch.

Several problems were not dealt with by the above analyses: one is why there should be a smooth gradation from true bifaces to bifacial racloirs and racloirs, the boundaries between these types being anything but clear-cut. Nor is it clear why 14% of the bifaces were made on flakes, upon which some effort had to be expended to reduce the butt and modify the profile; a far higher percentage would have been expected if the obvious advantages of using large flakes as biface-blanks had been exploited. Although 54 bifaces had S-twisted edges, 27 (exactly half) were made on flakes and 27 on nodules so that the nature of the blank is not the reason why this strange feature is present. It is also not certain whether the 'possible rough-outs' are, in reality, complete implements; if so, some analysts might see their massive and rough appearance as indicating a degeneration of biface-making skills, possibly a predictable development at the end of the Lower Palaeolithic, when there was a shift towards the exclusive use of flakes as blanks, and away from the use of bifaces. Others might regard their size and roughness as dictated by functional considerations - like the crude pick-like tools sometimes found in delicately made Mesolithic assemblages.

Before drawing further conclusions on the Level C bifaces, we would need larger samples and more precisely-defined attribute classes; in the meantime, we can perhaps consider 'outline' and 'size' as stylistic - i.e. culturally-determined features, since they do not seem to be associated with the functional attributes. In any case, it would be hard to pronounce in detail on function without first attempting microwear analyses of the implements concerned.

Finally, the presence of secondary (though not primary) products of biface production such as biface refreshment-flakes, finishing flakes (Table C.2), broken and re-worked bifaces etc., suggests that bifaces (perhaps already roughed out) were worked upon inside the cave. We will discuss this again in the following section.

## B(ii) OTHER HEAVY-DUTY TOOLS (26)

PICKS, 4 (Plate C.12)

The illustrated pick is the largest. Two are made on tabular slabs, two on pebbles. One is a quadrihedral with roughly formed, sinuous edges. The tips are more carefully made but very thick in section.

Analagous pick forms, usually roughly trihedral, occur in several Late Acheulean open sites in the Levant; in some cases, picks outnumber bifaces, for example at Ras Beirut IV (where Bergy describes them as "en forme de pyramides, de mitres, ou de prisms à 3, 4 ou 5 pans" (1932, p.199 and Planches XXII-XXIII); further afield, picks on river pebbles are common on the Riss terraces of the Rivers Orontes (Acharné: Besançon et al., 1978) and Euphrates (Maadan: Hours, 1979).

The Bezez picks would seem to represent an archaic feature, linking the Yabrudian to some ancestral Rissian Acheulean facies, unless once again we are to interpret their presence solely in functional terms, which we are not really in a position to do.

POLYHEDRONS, TYPE b ('POT-BOILERS'), 6 (Plate C.13)

These enigmatic but distinctive pieces are subspherical or cuboid flint pebbles, mostly decorticated, with convex polyhedral facets, suggesting that they have been formed by natural agencies (type a are the deliberately-knapped type, with concave flake removal scars). Each piece has from eight to thirteen scars with convex curvature, which seem to resemble positive rather than negative facets; according to J. Tixier (pers.comm., 1970) convex facets are a result of heating.

The writer recently observed similar convex faceting, together with pot-lid fractures and greasy lustre, on artifacts at Zakat II and Zaitiye II, two early Middle Palaeolithic factory sites on the Orontes valley (Besançon et al., 1978); since the thermal fractures occurred on already-made artifacts, the area must have been swept by fire sometime in the past.

The Bezez pieces were nicknamed 'pot-boilers' during excavation and it is possible that they formed part of the domestic equipment of the Yabrudians; they are here considered as manuports in the sense of M. Leakey (1971).

DISCS, 2

One specimen resembles pieces abundantly present in Tabun F and Ed; it appears to have been made from a Levallois core on a flake and has a plano-convex profile, domed base, and peripheral edge on a level with the flat flaking-surface.

RABOTS, 4

These are high-backed heavy end-scrapers or large push-planes, in two cases made on nodules and in two cases on thick flakes (one being 4.5cm. thick). The retouch is partially resolved, and in plan two are nosed, one of them being almost pointed.

MASSIVE SCRAPERS ON FLAKES, AND CLEAVERS, 10 (Plates C.5, nos.1 and 2; C.22, no.1; Fig.C.14, no.2)

These are heavy-duty side-scrapers with (in contrast to the rabots) thin, semi-abrupt working edges, as well as cleaver-like forms, all made on massive cortex flakes. Type a are roughly racloir-like, four being transverse, four offset and two bifacially retouched. The size and range is shown on Plate C.22, no.1 and Fig.C.14, no.2. Type b are the atypical cleavers; no.2 on Plate C.5 is an impressive specimen, classified by Professor Garrod as equivalent to the French hacherau. The other (Plate C.5, no.1) has a cleaver-like edge formed of the intersection of two flake-surfaces, but it also has scraping edges, one coarsely bifacial.

C. LEVALLOIS TOOLS (58)

TYPICAL LEVALLOIS FLAKES, 16; ATYPICAL LEVALLOIS FLAKES, 5

In the above two categories, seven are slightly retouched; all are from the layers of G or D256. Some pieces from M152 are sub-triangular.

LEVALLOIS POINTS, 3; ELONGATED LEVALLOIS POINTS, 1

Pieces in these two categories are quite typical and two have faceted butts. The elongated specimen (8.2 x 3.2 x 1.1cm.) comes from D256; it has a possible burin-blow at the tip, and inverse nibbling retouch on both edges.

LEVALLOIS BLADES, 29 (Plate C.24, nos.3 and 8)

These pieces resemble some of the Amudian blades at Abri Zumoffen (see below in Section II of this chapter). About half have faceted butts, the rest having plain or cortex butts (Plate C.24, nos.3 and 8). Eight have feathered-out tips, others have distal hinge-fractures, but in the majority the tip is broken off. Several are slightly retouched; this usually takes the form of discontinuous nibbling on one or both edges.

RETOUCHED LEVALLOIS POINTS, 4

All are typical and would pass unremarked in any Levalloiso-Mousterian assemblage. Only one elongated specimen occurred in Level C, in contrast to the frequency of this form in Level B. The retouch is irregular, and in one specimen is interrupted by two distinct notches (D255).

D. MOUSTERIAN TOOLS (17)

MOUSTERIAN POINTS, 3 (Plate C.14, no.7)

These are distinguished from convergent racloirs on the basis of their sharp and thin points. One is made on a broad Levallois flake (Plate C.14, no.7) and the others on triangular non-Levallois flakes, one with thinned base. Mousterian points amount to only 0.3% of the tools. At Masloukh, according to Skinner (1970), this form is similarly rare: 1.8%. The Bezez specimens are comparable to those from Tabun Ea (Plate XL, 10 and 9 in Garrod and Bate, 1937).

LIMACES, 9 (Plate C.14, nos.1, 3 and 5; Plate C.18, no.2; Fig.C.13, nos. 2 and 5)

Three are typical (Plate C.14, no.1; Fig.C.13, no.2). Four tend toward narrow bi-convergent *racloirs*, e.g. Plate C.14, no.5, which shows a core-preparation flake of *'de Bize'* type (de Lumley, 1968; Brézillon, 1968). On all these pieces the butt and bulb are absent and the retouch is sub-vertical, formed of both resolved and flat facets, undercut at the extremities.

The remaining pieces are atypical *limaces*, comparable to that depicted by F. Bordes from Yabrud (1955: Fig.8 no.2); alternatively they could be classed as double *racloirs*. Both have steep, invasive Quina retouch from end to end and are without butt or bulb; the drawn piece (Plate C.14, no.3) has a broken edge and a cortex back, the other is made on a *burin de Siret*.

Although not distinguished as such in the Mount Carmel publication, *limaces* form a striking group in the Tabun collections. Yabrud Shelter I level 25 seems to contain *limace*-like forms (e.g. Rust, 1950, Tafel 13, no.9), which resembles a piece from Bezez (Plate C.18, no.2). No *limaces* were reported from Masloukh.

PSEUDO-LEVALLOIS POINTS, 5 (Fig.C.18b, no.7)

Three are pointed, the largest being the illustrated specimen; two are of the polygonal or hexagonal type of Bordes (1961) and are characterised by the small butt, continued at an angle by a facet which was part of the core-preparation before removal. Four out of five pieces came from M152, attesting to the more prevalent use of Mousterian techniques in this part of the cave. Several other pseudo-Levallois points occur in Level C which have been retouched into tools (Fig.C.18b, no.2).

E. RACLOIRS, 487 (Plates C.14 to C.24; see also Figs.C.13 to C.18)

*Racloirs* are the dominant tool form in Level C, and show a wide range of sub-types, dimensions, qualities and kinds of *débitage*; the drawings illustrate the variations. The impression is gained that the form of the blank was of limited importance to the knappers, who concentrated on obtaining a scraping-edge by means of extensive retouch.

The *racloir* categories are those of F. Bordes (1953), all but the last four being based on the position of the working edge *vis-à-vis* the axis of the flake. As is clear from the Field Register, the excavators were using this scheme in place of the 'end-bulb, side-bulb, oblique-bulb' classifications used at Mount Carmel. The Hours type-list also used Bordes' categories, with slight modifications.

In the following inventory, broken *racloirs* are classed as they appear at present, *racloir* composites are excluded and placed with the second tool-type; sinuous-edged *racloirs* are placed as convex *racloirs*, straight/convex types with the straight convergents and the concave-convex types with the convex

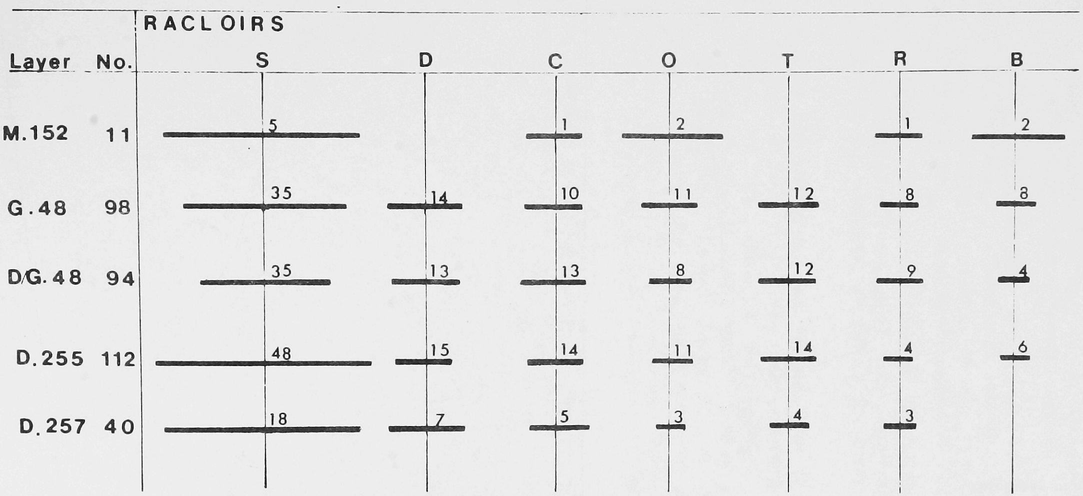



Fig.C.10. Seriation diagram showing the relative percentages of types of racloirs in five layers of Level C, representing various areas of the cave. The numerals above the percentage bars represent the numbers of racloirs in each category, in each of the five layers. The categories are: S = single, D = double, C = convex, O = offset, T = transverse, R = inversely, alternately retouched, backed etc., B = bifacial.

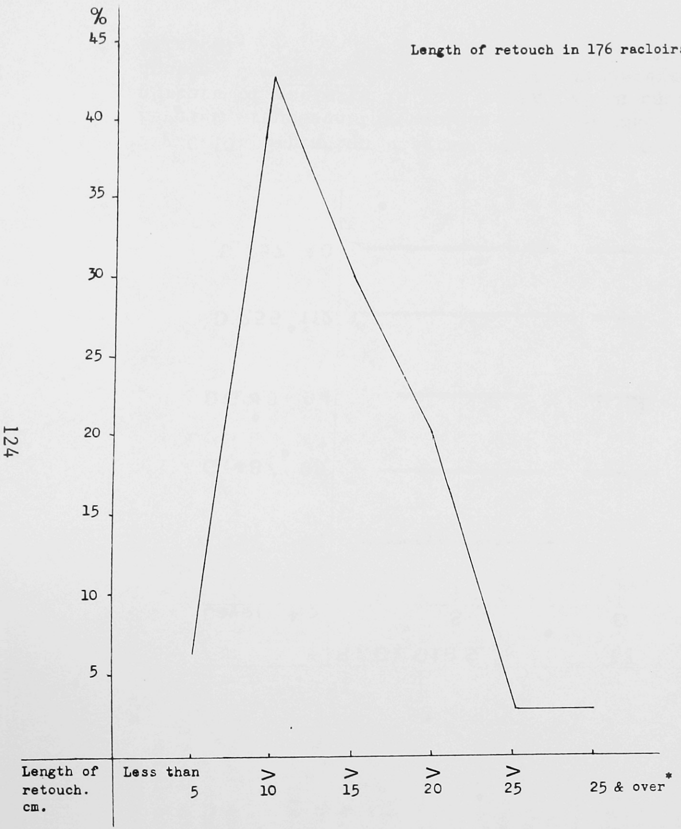



Fig.C.11a. Distribution of the length of the retouch in 176 racloirs from Level C. * The largest reading was for one racloir with 36 cm. of retouched edge.

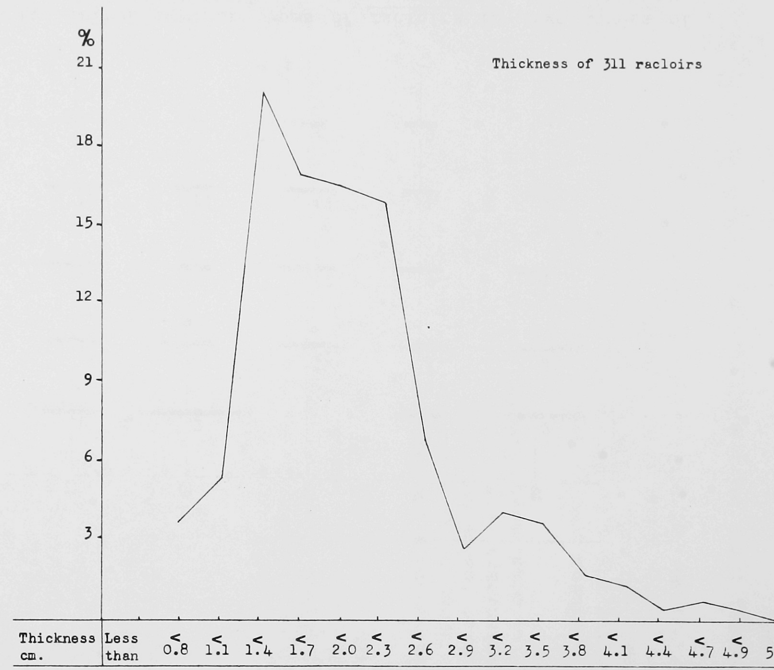



Fig.C.11b. Distribution of thickness in 311 racloirs from level C, divided into cells of 3 mm.

convergents. A piece is classed as a 'straight *racloir*' if the straight part of the edge is longer than any curved portion.

The heavier *racloirs* were more often made on thick flakes of Nummulitic flint, while the finer buff flint was generally used for thinner pieces. Most pieces are in good condition with sharp edges and without patina, but exceptions are in an advanced stage of desilicification, and others have heavily-used edges.

About 25% of the *racloirs* are made on cortex-flakes, but other blanks were noted as follows: 7 slabs and chunks, 9 nodules, 6 pseudo-Levallois points, 2 Janus flakes, 6 *de Bize* flakes, 19 Levallois pieces, 36 blades and 2 biface-preparation flakes.

A significant number (at least 10%) of *racloirs* have been burned, often very considerably, or have been subjected to some form of heating; this is in contrast to Level B, where few burned pieces occur.

The dimensions of the *racloirs* are varied, the length of the majority falling between 6 and 12 cm. The measurements were taken with the tool placed on the axis of percussion. The *Beirut collection* was sorted as follows: into 'small' (under 6 cm. long), 'medium' (6 - 12 cm. long) and 'large' (over 12 cm. long). These divisions apply to the width in the case of transverse flakes. Of a total of 320 specimens which could be measured, 9.8% were large, 54.5% were medium and 35.6% were small. Many of the smaller pieces were partly broken.

The absolute lengths of 212 of the pieces in the *Cambridge collection* consisted of the following: 41 less than 5 cm. long; 111 less than 8 cm. long; 53 pieces less than 12 cm. long; 5 pieces less than 16 cm. and 2 pieces over 16 cm. long. These values form a normal curve with a positive 'skew' towards long lengths. The widest *racloirs* are of course the transverse types, the widest measuring 21.2 cm., but the rest are much narrower than this. The width has been reduced intentionally on some in the group of seven pieces with thinned back. The thickness has been reduced on many pieces; a minimum of 110 *racloirs* (25%) have thinning retouch on the butt. Fig.C.11b shows the present thickness distribution, which must be largely the result of the knappers' intentions.

The dimensions are affected by three factors: the (sometimes extensive) amount of retouch; the orthogonal fractures which derive from the non-Levallois method of *débitage*, and the summary preparation of the core. Many pieces have vertical cleavage fracture, either at the tip or up one or both lateral edges; the *racloir* edge abuts on this, forming a sharp corner. The lateral cleavage planes might correspond to those on *burins de Siret* or to the *éclat fractionné* of Biberson (1961, Fig.34, p.438). In some *racloirs* these surfaces perform the function of a back or of a finger-rest.

Two important *racloir* attributes are the length of the working-edge (Fig.C.11a), and the kind of retouch which was used to form it. The longest *racloir* edge in Level C is 29 cm., seen on a massive transverse piece from D255.

As to retouch, the three prevalent kinds are: flat scalar or Mousterian, stepped scalar or resolved, and 'crushed', of which more is said below. The steepness is often misleading, and derives not from very abrupt retouch but from the natural thickness of the piece. Whichever kind of retouch is used, most of the single and double racloirs have their scraping-edges made directly through the cortex.

A rarer type of retouch occurs on large transverse and some offset types (e.g. those in Fig.C.12), which have retouch comparable to the racloirs transversaux convex, type Quina of France. In many pieces the retouch is carried out in three or more stages, the first rank of facets being the most invasive, and the others struck successively nearer to the scraping edge while overlapping the preceding rank. In some pieces this type of retouch covers most of the dorsal surface; 14 of these could be described as unifaces (the éclat retaillé sur une seule face en forme de biface of Biberson (1961, p.440 and Fig.37); see Plate C.14, no.2 and Plate C.21, no.1).

In the Quina group, which consists mainly of convergent racloirs with at least one end pointed, there is little or no retouch on the ventral surface. In contrast, in another group, bifacial retouch occurs on up to a third of the ventral surface, placed mainly below the scraping edge.

Although the designations 'Quina' and 'demi-Quina' (Brézillon, 1968, p.367) are not precisely defined, at least 62 Quina and 30 demi-Quina types seem to be present in Level C layers as follows: 8.5% - 11.9% in Trench D, 15.8 - 22.4% in Trench G and 2.5% in M152.

Eleven specimens have a working-edge so thin and finely retouched as to appear more suited for cutting and slicing than for scraping. On the (more prevalent) thick-edged pieces, the retouch on the extreme edge of the tool is often so fine and even that it must have been achieved by grinding or crushing; this feature is hard to reproduce in line drawings, but occurs on both ruler-straight and perfectly convex edges (Plate C.18, no.1 and Plate C.19, no.1). It seems to be unique to Yabrudian and Acheuleo-Yabrudian industries, at least in the Levant.

The 'rocking-chair' feature, described by Garrod and Bate at Mount Carmel (1937, p.80), is present on 24 racloirs, almost all of them transverse types; the rocking motion derives from the proximity of a large bulb to the working edge, which is curved upward at each extremity.

Pointed pieces are found not only in the convergent group but also among the offset types; some of these are extremely sharp (Plate C.20, no.1), but the acute-angled Winkelkratzer type (Rust, 1950) is rare in Level C.

SINGLE STRAIGHT RACLOIRS, 51 (Plate C.24 no.6)

Almost all of these are small and rather rough. The majority are made on non-Levallois flakes, in one case a tablet-like portion of a core, and in another case on a Janus flake (Plate C.24, no.6);

most have faceted butts and many have cortex on the opposed lateral edge. Seven specimens have Quina type retouch. Some ten specimens have additional retouch, usually to thin the butt or (more rarely) the tip, and in one case to make a retouched back.

SINGLE CONVEX RACLOIRS, 111 (Plates C.16, no.2; C.15, nos.2-4; C.17, nos.3 and 7)

The single straight racloirs grade into the convex type, but this group includes larger and more unusual forms, some so distinctive that brief comments cannot do them justice. At least 13 pieces have Quina, and 10 have demi-Quina, retouch. Some 26 have been thinned at the butt. Two have retouch all over the dorsal surface. Six have thin slicing edges, 6 have rather rough, sinuous edges, and 9 have slightly denticulated edges (Plate C.15, nos.2 and 4). The drawn pieces are described on pp.183-5. As in most Mousterian sites, single convex racloirs form the largest racloir group. Skinner noted their dominance at Masloukh (1970), but an exception may be Yabrud I, where Skinner (1965) found a low count of single racloirs in level 22, the 'typical' Yabrudian layer.

SINGLE CONCAVE RACLOIRS, 9 (Plate C.17, no.1; Fig.C.18b, no.2)

These are small, the largest being the drawn piece, which is tending toward a straight racloir; it is made on a longitudinally-split flake. The piece shown on Fig.C.18b, no.2 is made on a pseudo-Levallois point.

Only one of this group has demi-Quina retouch; 3 have thinned butts and one has a slightly denticulated edge.

DOUBLE STRAIGHT RACLOIRS, 5

In this and the following double racloir groups, the two retouched edges are separated either by cortex, broken areas or the natural feathered-out end of the flake; one specimen is made on a plunging flake. Two double straight racloirs are made on Levallois pieces and one is made on a biface-preparation flake.

DOUBLE STRAIGHT/CONVEX RACLOIRS, 18 (Plate C.18, no.1)

The drawn piece is a thin flake with plain butt and double patina. One piece is made on a Levallois blade, another on a non-Levallois point.

DOUBLE STRAIGHT/CONCAVE RACLOIRS, 2

Both are somewhat atypical, the piece from D255 being a fragment.

DOUBLE BICONVEX RACLOIRS, 25 (Plates C.17, no.6; C.18, nos.3 and 5)

A few of these have broken tips, and might have been either convergent or biconvex racloirs.

This is a very varied group. The thinnest piece is 0.9cm. thick, made on a tabular flint first-flake (D257), and there are 3 pieces with Quina retouch, one uniface, and two curious pieces with very distinct biconvex edges made on the butt end of each (G50 and

G/K48); the larger of the latter has a thin slicing edge, in this case made by flat scalar invasive Quina faceting.

DOUBLE BICONVEX RACLOIRS, 3 (Fig. C. 18a, no.2)

Each representative of this rare form is well-made. The sketched piece is made on an oblong flake of fine-grained Nummulitic flint, with feathered-out tip and dihedral butt.

DOUBLE CONCAVE/CONVEX RACLOIRS, 16 (Plate C. 18, no.6)

The drawn piece is made on a blade of glossy grey flint, and the all-over retouch includes part of the tip. One piece is on a pseudo-Levallois point (D256). The other pieces are rather small and delicate, with flat faceting. One is a Levallois blade with inverse scalar flaking on one edge.

Note: Nine of the double racloirs had Quina or demi-Quina retouch, 15 had thinned butts, five had slightly denticulated edges and three had all-over (couvrante) retouch.

CONVERGENT STRAIGHT AND STRAIGHT/CONVEX RACLOIRS, 4 (Plate C. 14, no.6)

Two of the straight pieces are pointed (G48); one of the others has a sharp but rounded tip, and the other a tip off the axis. One is a Quina type, passing to a limace, and has the rocking-chair feature.

CONVERGENT BICONVEX (38) AND CONCAVO-CONVEX RACLOIRS (7), total 45 (Plates C. 14, nos.2, 4 and 8; C. 16, no.1; C. 24, no.9; Figs. C. 17, nos.3 and 7; C. 18b, no.5)

The biconvex group includes some of the best-made racloirs in Level C, of which the six unifaces are the most distinct (Plate C. 14, no.2). Most of these are leaf-shaped, but are too broad and flat to be considered as limaces. They present a rather curved profile and one (Plate C. 16, no.1) is passing to a biface. Contrasting with the unifaces is a massive element (Plate C. 24, no.9) of pieces which resemble early Acheulean scrapers (cf. for example Bordes, 1961, Plate 20, no.1); one of these has a thick point on the butt. Examples occur in D255, M158 and G50.

Ten specimens have Quina retouch (Plate C. 16, no.1), nine have slight denticulations, nine have thinned butts. On five pieces the convergent edges are made on the butt end of the piece (Fig. C. 18b, no.5); one is a double (i.e. two-ended) convergent racloir with an edge retouched all around, the point being on the butt.

Of the concavo-convex pieces, three are beaked (Fig. C. 17, no.7), and one is made on a pseudo-Levallois point with steeper retouch inside the concavity. The others have sharp points and demi-Quina retouch; one may be the tip of a re-worked biface.

Two racloirs with triple edges are included here (Fig. C. 17, no.3); since the edges are located squarely on the axis, neither can be regarded as offset, as are the other triple racloirs.

CONVERGENT RACLOIRS, BEZEZ TYPE, 11 (Plates C.17, no.5; C.19, nos.2 and 3; Fig.C.17, nos.1 and 2)

This convergent variant is defined as having one long edge and one short (c. 2cm.) convex or straight lateral edge, separated by a rounded thin tip, finely retouched; on the short edged side, a perpendicular back forms the proximal part, formed either of cortex or of primary preparation facets. These pieces cannot be classed as end-scrapers, owing to the thinness of the tip, which is like a knife-edge. The tip also seems unsuited for heavy scraping duty, so that the function of this tool remains unknown. It is termed 'Bezez type' because it has not been specifically recorded at other sites.

Plate C.19, nos.2 and 3 show this type in its typical form and Plate C.17, no.5 shows a rougher piece, more of a normal biconvex convergent. The length/breadth ratios of this group fall between 2.1 and 2.8. The main characteristics of the 8 most typical pieces are tabulated in Table C.6.

OFFSET RACLOIRS, 44 (Plates C.19, nos.1 and 6; C.20, nos.1-3; C.21, no.1; Fig.C.17, no.4)

Most of these are well-made and distinctive pieces. Only one is massive, the majority being from 4 - 7cm. long on the flake's axis. More than half are transverse flakes with length/breadth rations in the 0.7 - 0.9 range. These grade into slightly more elongated specimens with rations in the 1.0 - 1.8 range. On some pieces the degree of cant is either on or close to the 25° mark (Plate C.19, no.1), and these grade into convergent racloirs. However, in the majority the converging edges meet at an angle markedly off the axis of the tool. On five pieces (2 in G48 and 3 in D255) this angle is particularly acute (Plate C.20, no.1), as in the Winkelkratzer described by Rust at Yabrud I, and the pointed, acute-angled form described by Garrod and Bate at Mount Carmel.

In contrast, a few pieces have rounded, or bec-like points on the angle (Fig.C.17, no.4). In two cases, the secondary edge is on the ventral surface (Fig.C.18a, no.3). One piece is a composite, having a Clactonian notch on the third edge (D/G48). Two have slightly denticulated edges, and 16 have thinned butts. Ten have Quina retouch and five have demi-Quina retouch; the majority of these are made on large transverse flakes, and indeed, some are intermediate between offset and transverse racloirs, since only the transverse edge has substantial retouch (Plate C.21, no.1).

TRIPLE RACLOIRS, 5 (Plate C.18, no.4; Fig.C.18a, no.3)

Most of these are polygonal flakes with various forms of edges and angles. In the notation suggested by Bordes (1961, p.27), one typical specimen would be listed as "b D b O a D c". A piece from G48 has its third edge across the butt end. Another is passing to a composite, one corner being defined by two small notches as in a bec burinant.

Two pieces have Quina retouch, one has demi-Quina retouch, four are thinned on the butt and four are made on transverse flakes.

| Measurements in cm. | Layer and collection | Blank | Backed edge | Retouch on the retouched edge | Tip | Illustration |
|---|---|---|---|---|---|---|
| 10.0 x 4.4 x 1.7 | D/G48 London | Non-Lev. blade with (?ochre) blotches | Natural to within 2 cm. of tip, where retouch is semi-abrupt sub-parallel | Butt to tip; invasive step scalar facets | Ogival | Plate C.19, no.2 |
| 8.2 x 3.1 x 2.0 | D257 London | Longtitudinally split flake | Natural cleavage plane to within 2 cm. of tip. Abrupt retouch becoming knife-thin at tip | Butt to tip; step scalar facets, steep near tip | Pointed, straight/ convex | Plate C.19, no.3 |
| 10.0 x 4.5 x 1.9 | D/G48 London | Non-Lev. cortex blade | Sub-vertical, cortex to within 3 cm. of tip where retouch is semi-abrupt | Butt to tip; parallel semi-abrupt facets | Ogival | Plate C.17, no.5 |
| 9.1 x 4.0 x 1.7 | G48 St.J., Beirut | Non-Lev. blade | Cortex to within 2.3 cm. of tip, where retouch is semi-abrupt | Butt to tip; invasive step scalar, steep near butt | Rounded narrow | Fig.C.17, no.1 |
| 7.7 x 3.6 x 2.0 | D/G48 A.U.B., Beirut | Non-Lev. cortex blade | Cortex to within 2 cm. of tip, where retouch is sub-parallel; burin at butt | Butt to tip; almost straight, semi-abrupt, sub-parallel facets | Pointed | Fig.C.17, no.2 |
| 9.3 x 3.7 x 1.3 | D255 London | Elongated non-Lev. blade with central ridge | Cortex on one part; some retouch at butt end, and near tip | Butt to tip; flat invasive retouch, but abrupt near tip | Squared-off; thicker than other pieces | |
| 9.2 x 3.3 x 1.8 | D255 London | Non-Lev. 'orange-slice blade' | Cortex | Butt to tip; almost straight, parallel | Rounded | |
| 'Medium' | M158 A.U.B., Beirut | 'de Bize' blade | Natural cleavage plane | Irregular step scalar semi-abrupt | Pointed, but atypically | |

Table C.6. The main characteristics of eight Bezez-type convergent biconvex racloirs.

TRANSVERSE RACLOIRS (63)

This important and distinctive group forms almost 13% of the Level C racloirs. Some pieces have been somewhat subjectively classified, since this category grades into other forms; for example some massive and rough specimens tend towards massive scrapers (Plate C.20, no.5) and pieces made on a certain kind of heavy transverse flake with pointed left hand corner (see below) tend toward either offset or bifacially retouched categories (as in Fig.C.12).

Transverse racloirs are made on a variety of flake blanks: 13 are made on flakes with thinned butt, 14 on flakes with intact bulb and rocking-chair feature. Seventeen have Quina retouch, 10 have demi-Quina retouch, and on the whole this group has (with the exception of the unifaces) more dorsal retouch than any other category. Several others are made on cortex flakes with retouch done only to make the edge. Some pieces have a small amount of retouch on a second edge, possibly the result of secondary shaping. In some cases this is connected with butt thinning (Plate C.21, no.1)

In contrast to pieces with an incipient second edge, on at least ten specimens the scraping-edge is confined to the distal end of the piece by perpendicular primary facets (méplats) or cortex areas (Plates C.21, no.3; C.22, no.2); this feature may represent an exploitation of non-Levallois techniques to increase the tool's handiness; it is quite common on racloirs in the Yabrudian layers at Abri Zumoffen (see Garrod and Kirkbride, 1961).

Some of the large transverse racloirs in Level C seem to fit Bordes' description of certain French Quina types "sur éclats epais qui semblent avoir été débités specialement pour leur fabrication" (1961, p.28). One massive specimen (13.0 x 21.0 x 3.8cm.) is made on the characteristic almond-shaped flake with pointed left extremity (cf. Figs.C.12; C.17, no.7) and may also compare with a type described by Biberson which was struck from a "type ancien de nucleus préparé" (1961, p.450, Figs.44-46). If so, this type would differ from the unifacial group, on which the central dorsal retouch was done after the flake was struck off the core. These special flakes may result from use of a para-Levallois technique (Brézillon, 1968, pp.83 and 84).

TRANSVERSE STRAIGHT RACLOIRS, 9 (Plate C.22, no.5)

Two are large, two medium and five small (4 - 5cm. wide). Two have edges limited by méplats. Two have the rocking-chair feature (Plate C.22, no.5), one has a thinned butt, one has Quina and another demi-Quina retouch. Two have slightly denticulated edges and two have double patina.

TRANSVERSE CONVEX RACLOIRS, 51 (Plates C.20, no.5; C.21, nos.2 & 3; C.22, nos.3 & 4; Fig.C.17, no.6)

Nine of the measurable pieces were large (Fig.C.12), 19 were medium and 9 were small. Five have edge-limiting méplats (Plate C.21, no.3), 9 have thinned butts (Plate C.21, no.2). One is made on a pseudo-Levallois flake and has an additional chopping-tool-

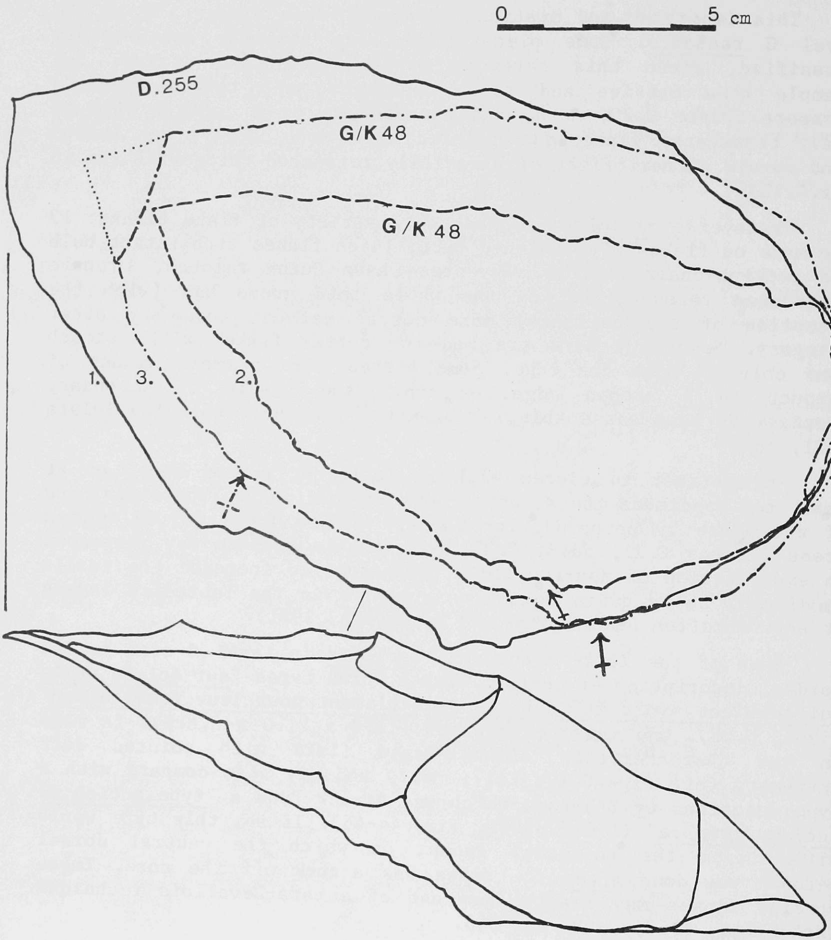



Fig.C.12. Outlines of three Quina racloirs, made on similar massive transverse flakes with pointed left extremity. Arrows show position of butt.

1. Outline and (in lower view) base profile of Fig.C.17, no.6, a Quina transverse racloir.

2. Outline of Plate C.21, no.1, a Quina offset racloir.

3. Outline of Fig.C.18a, no.1, a Quina racloir with bifacial retouch.

The profiles of nos.2 and 3 are omitted for the sake of clarity.

like edge formed by butt-thinning retouch (Plate C.21, no.2). Two specimens are passing to the large Acheulean flake scraper type; Plate C.20, no.5 shows one with double patina, on which the edge has been broken and re-worked.

Fifteen have Quina and at least 7 have demi-Quina retouch. Five have small areas of bifacial retouch; in Fig.C.12, no.1 is a massive 'special flake' with inverse retouch.

TRANSVERSE CONCAVE RACLOIRS, 3 (Plate C.22, no.2)

These are typical and fairly small. The drawn piece is complete, having steep (?demi-Quina) retouch, edge-limiting méplats, and a pronounced bulb. The others are broken, and on one, the break may have been re-worked to form a point.

INVERSELY RETOUCHED RACLOIRS, 10 (Plate C.19, no.4; Plate C.20, no.4)

Four are single racloirs, 2 are offset racloirs with retouch on the ventral surface. Two are double racloirs with alternating direct and inverse retouch on the second edge. Two are possible candidates for the divers category; one (Plate C.20, no.4) has a cortex dorsal surface (not shown) and the racloir edge has been formed on the butt of the flake at its junction with the cortex face.

ABRUPTLY RETOUCHED RACLOIRS, 5

These are rather irregular and atypical, two being small, broken pieces; one is slightly rolled and has double patina. On one piece the edge opposed to the abrupt racloir edge is formed of primary preparation facets, and on another a racloir edge seems to have been made on a backed knife.

RACLOIRS WITH THINNED BACK, 8 (Plate C.15, no.1; Fig.C.18b, no.6)

These are pieces with modified lateral edge (opposed to the racloir edge) as distinct from modification of the butt. Three are large, three are medium and one is small. One is made on a tabular nodule, three have Quina retouch, and four have thinned butts in addition to thinned backs (Fig.C.18b, no.6). In three cases the back is made by inverse retouch, in one case by alternate retouch and in one case by primary preparation facets. In one case (Plate C.15, no.1) the back is indistinct and battered and is opposed to a well-made convex racloir edge.

BIFACIALLY RETOUCHED RACLOIRS, 26 (Plate C.17, no.4; Figs.C.16, no.2; C.18a, no.1; C.18b, no.4)

Pieces in this category grade both into bifaces and into normal racloirs. In practice, four kinds of bifacially retouched racloirs occur:

1) Normal racloirs with additional retouch on part (or all) of the inverse side of the scraping edge. Seven occur in Level C; 3 single convex, 2 biconvex, one concavo-convex and one alternately retouched.

2) Thin slabs or other tabular nodules which are made into racloirs by retouching both sides of one edge; these are not bifaces in the accepted sense. One example (Plate C.17, no.4) has discontinuous retouch on the reverse of what is otherwise a convergent biconvex racloir, made on a 2.3 cm.-thick slab. Seven similar specimens occur in Level C.

3) 'Tranchoirs': As defined by Bordes (1961, p.30) these can be distinguished from backed bifaces by their asymmetrical profile and sinuous edge (ibid., p.68); only four rather atypical examples occur in Level C (Fig.C.16, no.21 Fig.C.18b, no.4). The latter has transversely-placed (primary?) retouch, reminiscent of that made by the Tabelbala-Taschenghit method (see Brézillon, 1968, p.921 and Tixier, 1960, p.84).

4) Quina bifacial racloirs: (In Bordes' scheme, these are not separated from the tranchoirs, owing to the number of intermediate forms.) Eight pieces in Level C seem to have been made on special flakes as described above under transverse racloirs (Fig.C.18a, no.1). They are thinned at the butt, and have bifacial retouch on the main racloir edge; all eight come from the layers of Trench G. All are fairly large, one is a uniface type, two have demi-Quina retouch and all are either double (straight/convex or biconvex) or convergent.

As already mentioned, the distinction between (a) bifaces made on flakes and (b) racloirs of Quina and tranchoir type is ill-defined; bifaces and racloirs clearly grade into each other in Level C.

Large pieces similar to these occur at Ras Beirut accompanied by massive prepared flakes in an assemblage called 'Vieux Levallois' by Père Fleisch (1956) which appears to be chronologically "post-Riss" and typologically earlier than Levalloiso-Mousterian.

ALTERNATELY RETOUCHED RACLOIRS, 9 (Plate C.17, no.2; Fig.C.16, no.4)

Five are convergent and three are double (straight/convex or biconvex) racloirs, and the first drawn piece has its broken tip roughly re-worked to a chisel-end. The second drawn piece is made on an atypical Janus flake with a butt at each end, one of which is retouched to make the racloir edge.

RACLOIR FRAGMENTS, 17

These are small portions of racloirs broken in antiquity, as well as parts of racloirs destroyed by burning or desilicification. Some pieces (especially from Trench D) were newly broken while being extracted from the breccia. Six are tips, 3 of convergent and 3 of double racloirs; the rest appear to have been single types.

## GENERAL REMARKS ON THE RACLOIRS

Racloirs with one edge numerically exceed those with two (236 and 179 pieces respectively); in the single-edged group, after the single convex types, the transverse convex types are the most

numerous. As Fig.C.10 shows, broadly comparable percentages occur in all the layers except in M152 (where there are only eleven racloirs). As mentioned earlier, further racloirs occur on tools which have been classed as composites. At Tabun in Bed 48A, Jelinek (1974) reports similar high percentages for single convex and transverse convex racloirs.

## E. END-SCRAPERS (10)

TYPICAL (5) and ATYPICAL (2) END-SCRAPERS, total 7 (Plate C.23, nos.5 and 6); END-SCRAPER COMPOSITES, 3 (Fig.C.17, no.5)

Various forms of distal end-scraper occur, and virtually all specimens have some kind of lateral retouch. Two of the typical specimens and two of the composites are carinated end-scrapers on retouched flakes (Plate C.23, nos.5 and 6). Two others are end-scrapers on flakes, another is an end-of-blade scraper and the last is a fan-scraper type.

The three composites are associated, one with a bilateral denticulate, one with a double straight convex racloir and the third with a single denticulated edge.

The atypical pieces have in one case a rather indistinct frontal edge and in the other case an edge re-made on a break.

Exactly half of the end-scrapers have denticulated lateral edges, and four others have indistinct lateral retouch. None of the pieces in this group are similar to Upper Palaeolithic types, and seem rather more in the spirit of racloirs. No.7 in Fig.C.17 has been classed (on the basis of its broad distal end) as an end-scraper composite; it has a typically Yabrudian crushed retouch on the lateral edges. The piece shown as no.6 in Plate C.26 comes from the Breccia BBh, discussed in Appendix B to this section of Chapter 4, below, p.206.

## G. BURINS (22)

TYPICAL BURINS, 11 (Plate C.23, nos.1, 2 and 4); ATYPICAL BURINS, 4; BURIN COMPOSITES, 7 (Plate C.23, no.3; Fig.C.17, no.2)

In contrast to the end-scraper group, the burins form a distinctive component in Level C. They are usually simply but boldly made on robust blanks, such as cortex flakes and other non-Levallois thick flakes, nodules (2 specimens), broken racloirs (2 specimens); two thinner pieces are made on Levallois-like blades. Two could be considered as massive proto-burins (M152 and D256).

The burin edge is often fairly broad; of the three broadest (Plate C.23, no.3) one edge measures 1.3 cm. Four burins have been refreshed several times (Plate C.23, no.2). Five specimens have rather indistinct lateral retouch.

One of the composites is associated with a Clactonian notch (Plate C.23, no.3) and two with Bezez-type convergent racloirs (Fig.C.17, no.2); one of the latter is an Adlun burin (see the section on Abri Zumoffen, below). One composite is on a denticulate and the rest are on single racloirs. One of the latter is a double

| Category | Layer M152 | G50 | G48 | D/G48 | D256 | D255 | D257 | Total |
|---|---|---|---|---|---|---|---|---|
| Single blow: | | | | | | | | |
| proximal (i.e. on the butt) | 1 | | | 2 | | | 1 | 4 |
| distal on a break | | | 1 | 1 | | | | 2 |
| distal, plan | | | | | | 1 | | 1 |
| distal, 'dihedral' | | | | 1 | 3 | | | 4 |
| Dihedral: | | | | | | | | |
| straight | 1 | | 1 | | | 1 | | 3 |
| right-angle | 1 | | | | 2 | | | 3 |
| Truncation: | | | | | | | | |
| straight | | | 1 | 1 | | | | 2 |
| on a notch, single (Adlun burin) | | | | | 1 | | | 1 |
| on a notch, double (double Adlun burin) | | 2 | | | | | | 2 |
| Total | 3 | 2 | 3 | 5 | 6 | 2 | 1 | 22 |

Table C.7a. Distribution of burin categories in the layers of Level C.

| Edge-type / Type of serrations and location | Thin serrations | | Thick serrations | | Other | | Total |
|---|---|---|---|---|---|---|---|
| | Obverse | Inverse | Obverse | Inverse | Obverse | Inverse | |
| Lateral | 8 | 1 | 4 | | 1 | | 14 |
| Lateral and distal | 2 | | 2 | | 1 | 2 | 7 |
| Bilateral | 10 | 3 | 3 | 1 | | 1 | 18 |
| Convergent | | | 2 | | | | 2 |
| Distal (transverse flakes) | 1 | | 3 | | | | 4 |
| Totals | 21 | 4 | 14 | 1 | 2 | 3 | 45 |

Table C.7b. Distribution of edge-types in 45 denticulates with thin or thick serrations.

Adlun burin; there are two other double burins, one on a racloir (Plate C.23, no.4).

The burins are distributed as shown in Table C.7a; in this table the 'distal dihedral' type of single-blow burin has the negative facet of the burin spall on the thickness, whereas the 'plan' type has it on the ventral surface. Trench D seems to contain rather more and better-made pieces than the other trenches.

GENERAL COMMENTS ON THE BURINS

Although the Level C burins closely resemble those from Abri Zumoffen, the Bezez group differs from the latter by containing fewer burins made on blades and fewer Adlun burins (burins made on a truncation in the form of a notch).

H. PERFORATORS, 2 (Plate C.23, no.8)

In Level C, perforators are virtually absent, appearing only twice, with other tools. The drawn piece is made on a single concave racloir, the second one resembles a Tayac point. It has a thick tip reminiscent of the tips of Micoquian bifaces. The scarcity of piercing tools in Bezez C is duplicated at Mount Carmel, where none were recorded by Garrod and Bate, and only two (in Bed 48A) by Jelinek (1975). Although Rust noted a few pieces at Yabrud Shelter I, Bordes (1955) noted none in the same material. At Masloukh, Skinner (1970) recorded seven perforators, which formed 0.4% of the industry.

I. KNIVES (34)

TYPICAL KNIFE WITH RETOUCHED BACK, 4 (Plate C.24, no.1); ATYPICAL KNIFE WITH RETOUCHED BACK, 6 (Fig.C.18a, no.4; Plate C.24, no.2); NIBBLED PIECE, 6 (Plate C.24, no.5); BACKED KNIFE COMPOSITE, 1; NATURALLY-BACKED KNIFE, 18 (Plate C.24, no.7)

Of the four typical knives, the drawn piece is neatly made on a very narrow transverse flake and the cutting edge has use retouch on parts of both surfaces. Another piece is a heavy flake with a thick, steep back. The other two have backing only near the tip, consisting of abrupt, parallel facets c. 4 - 5mm. thick. The atypical knives include specimens with partial cortex back, and specimens with rough lateral retouch which becomes abrupt at the distal end - the "San Remo" type of de Lumley (1968) - as well as 4 specimens made on Levallois blanks (3 blades and a point).

The nibbled pieces are similar to those defined at Abri Zumoffen by Garrod and Kirkbride (1961, pp.29-30) as having only the extreme edge of the blank removed by minuscule abrupt retouch. The back thus formed is only c. 2mm. thick, in which it resembles the finger-rest area on the modern pen-knife. The most prevalent form of knife at Abri Zumoffen was an incomplete Levallois-like blade with minute abrupt retouch on one edge; three of the six specimens in Level C are also on blades, one of them Levallois. The others are on Levallois-like points (Plate C.25, no.5).

The single composite is an atypical backed knife on a buttless piece with partially retouched back, opposed to a single blow burin plan (G48).

The backs on the naturally-backed knives are as follows: three by primary preparation facets (Plate C.24, no.7), two are part-cortex, part-faceted; the remainder have cortex backs, five of which are 'orange-slice' blades, wedge-shaped in section, and two of which are on atypical Levallois blades. The largest measures 12.0 x 6.8 x 2.1cm.

Pieces are included in the naturally-backed knife category only if they show use retouch on the working-edge even though, as Jelinek (1974, p.37) has pointed out, this practice would tend to exclude knives which had been used only on soft materials.

At Tabun a high number of naturally-backed knives are recorded in Bed 48a, which can only be matched by the number in M152 at Bezez (c. 12% in each case).

## J. TRUNCATED PIECES (4)

TRUNCATED FLAKE, 2; DOUBLE TRUNCATED-FACETED PIECE, 2 (Fig.C.18b, no.1)

The truncated flakes are atypical; in both cases the truncation has resulted from the reworking of a broken distal end. Truncated-faceted flakes occur mainly in the Levalloiso-Mousterian; they represent a technique in which the butt or distal end (or both) of a flake is removed by indirect retouch, and a secondary flake struck off the dorsal surface along the same axis from the resulting striking-platform. In the case of Fig.C18b, no.1, the lateral edge has some irregular retouch which is possibly accidental, since the piece is abraded. The second piece is without lateral retouch.

Truncated-faceted flakes were first illustrated by Schroeder (1966, p.205, Plate I, no.1) from Jerf Ajla and described by the same author at the London terminology symposium (1969). Occurring throughout the Jerf Ajla sequence (ibid., pp.396-403), this artifact can have distal, proximal, lateral or multiple truncations, occasionally without secondary removals.

More recently, the same type was reported as an éclat tronquée ou bitronquée by Fleisch (1971, p.49) at Naamé, and by R.S. Solecki as 'truncated, faceted and thinned flakes' at Nahr Ibrahim (1970a, p.127); a special study of the latter was made by R.L. and R.S. Solecki (1970). The latter authors interpret the secondary removal of flakes as a thinning method, but strictly speaking the formation of a platform and the subsequent striking off of a flake makes this artifact a 'core-on-a-flake', as Newcomer and Hivernel-Guerre (1974) have pointed out.

Our two specimens have not been further retouched to make another tool, but surely any flake removed could not have been of much use as a tool. The two pieces are included here as a recurring type, while their possible function remains unknown.

## K. NOTCHES AND DENTICULATES (76)

RETOUCHED NOTCH, 48 (Plate C.23, nos.7 and 9; Fig.C.18b, no.3); BEC BURINANT, 3 (Fig.C.16, no.3); DISTALLY-NOTCHED PIECE, 4 (Plate C.24, no.4)

All the notched pieces are made on a variety of small-to-medium sized blanks (Levallois and non-Levallois blades, flakes and points as well as single and double truncated-faceted flakes). All are single lateral notches except one, on which the notch is made on the butt (M152); one has inverse notches, another has additional squamous retouch, and both are tending towards composites.

The double (27) and single (18) denticulates are divided between those with thin, narrow denticulations (the micro-denticulate type of Bordes: 1961, p.36) and those with thick, wide denticulations. The attributes 'thick' and 'thin' apply only to the teeth and not to the thickness of the blank. As shown in Table C.7b, 15 are clearly 'thick', 26 are 'thin', five had both thick and thin denticulations and two were indeterminate. As noted above, denticulated pieces with rounded front are placed as end-scraper sub-types. Pieces on which the notches seem to have been accidentally caused are excluded; a borderline case is shown in Plate C.23, no.7.

Convergent denticulates (Pointes de Tayac) are rare in Level C, only two being present (Plate C.23, no.9). A heavy, wide-toothed piece of Acheulean aspect (G48) resembles the racloir in Plate C.24, no.9. One of the two composites is a thin bilateral denticulate with a Clactonian notch (G48) and the other is a thick single denticulate with two becs burinant (D257). Seven denticulates are made on Levallois blanks, five on backed flakes (Fig.C.18b, no.3), four on truncated-faceted flakes, two on pseudo-Levallois points and one on a tabular slab. As Table C.3 indicates, denticulates are scarce in Trench D and seem to cluster in the layers of Trench G.

The drawn bec burinant (Fig.C.16, no.3) is a composite, associated with a transverse convex racloir; the latter has an older patina. A specimen from G50 has been similarly made on an older racloir, and the third is made on a notched flake. Less distinct specimens occur on some of the other tools.

The distally-notched pieces are rare and not very distinct, one verging on a transverse concave racloir (G48) and another on a bec/distal notch composite (G/K48).

### GENERAL COMMENTS ON THE NOTCHED GROUP

The denticulates seem to form a distinct group, but the notches and other variants are rather atypical in Level C. At least three denticulates seem to have use-wear on the teeth rather than inside the notches, a feature noted at Ain Musa in an 'Acheuléo-moustérienne' assemblage by Duvignau (1930). At Tabun, Jelinek reports no notches in Bed 48A, but a comparable (5.7%) denticulate index occurs here; see Table C.9, which show the average denticulate index (IV) in Level C to be c. 5.0%.

## L. RETOUCHED PIECES, 22 (Plate C.19, no.5)

These are retouched flakes which do not conform to any of the types listed above. The type of retouch is noted on Table C.3 and consists of about 2 - 3cm. of small, sometimes irregular faceting. There is also a group of 15 large Nummulitic flakes; most of these have retouch which appears to be incomplete or made by primary faceting. They may represent rough-outs.

## M. DIVERS, 5

This category is reserved for re-worked or indeterminate pieces. One seems to be an unfinished bifacial racloir, three are racloirs which were possibly re-used as cores, and another (which has had various re-workings) now forms a rough denticulate. Two are too desilicified to be classifiable.

## UNRETOUCHED AND OTHER PIECES

Of the remaining artifacts which are not clearly 'tools', the following were counted:

UNRETOUCHED NON-LEVALLOIS FLAKES (124); UNRETOUCHED NON-LEVALLOIS BLADES AND POINTS (42); FRAGMENTS (11; from a larger number)

These are the unretouched pieces of various kinds, already discussed under 'products' above. The 176 pieces include 11 biface preparation-flakes, two crested flakes, two Janus flakes, four truncated-faceted fragments, 46 blades and two possible bifacial fragments, the remainder being non-Levallois flakes, as well as five buttless fragments of tabular flint and some unrecognisable desilicified flake fragments.

As it stands at present, the waste material forms c. 20% of the whole flint count from Level C. This percentage is however the result of selection: further pieces of flint, diagnosed as unworked, as well as small waste chips, were set aside by the excavators after the first sorting and could not be considered in this study. They were buried (accompanied by dated modern Lebanese coins) below the floor of the National Museum, Beirut. An idea as to the true amount of waste can perhaps be gained from the Tabun records: Garrod and Bate reported a high (90%) tool-to-waste ratio in Locus QQ (1937, p.45), while in Bed 48A Jelinek records a 50% ratio. At Masloukh, Skinner reported an average of 75% waste. It is likely, therefore, that at least 30% more waste material was originally present in Level C. Under the circumstances, we cannot usefully attempt to compare the amount of dêbitage produced by the Level C Yabrudians' knapping methods with that produced by the Levalloiso-Mousterians of Level B; however, figures from both excavations at Tabun suggest that waste flakes are much less prevalent in Yabrudian layers, where the Levallois technique was seldom used.

This concludes the description of the Level C material listed in Tables C.2 and 3. Another group of artifacts, referred to in Table C.1 as the "Tayacian Flakes", were found at the base of Level

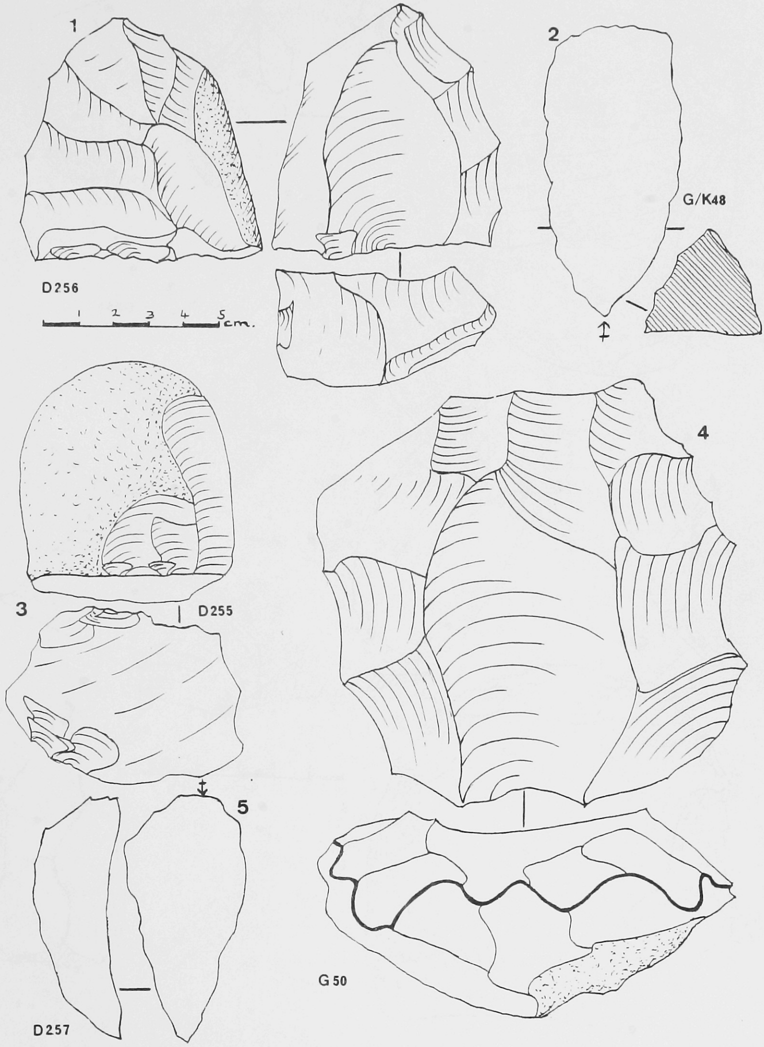



Fig.C.13. Level C. Schematic sketches of artifacts in the Beirut collection: 1) Levallois core showing two kinds of upper surface preparation. 2) Outline of a <u>limace</u> with point at butt end; other end is broken. 3) Prismatic core on a split pebble; the striking-platform (lower view) was formed by retouch. 4) Classic Levallois tortoise core from which a long pointed flake was struck; patch of cortex on area of point of impact at base and traces of subsequent removals from upper end. 11.7 x 12.2 x 5.7cm.

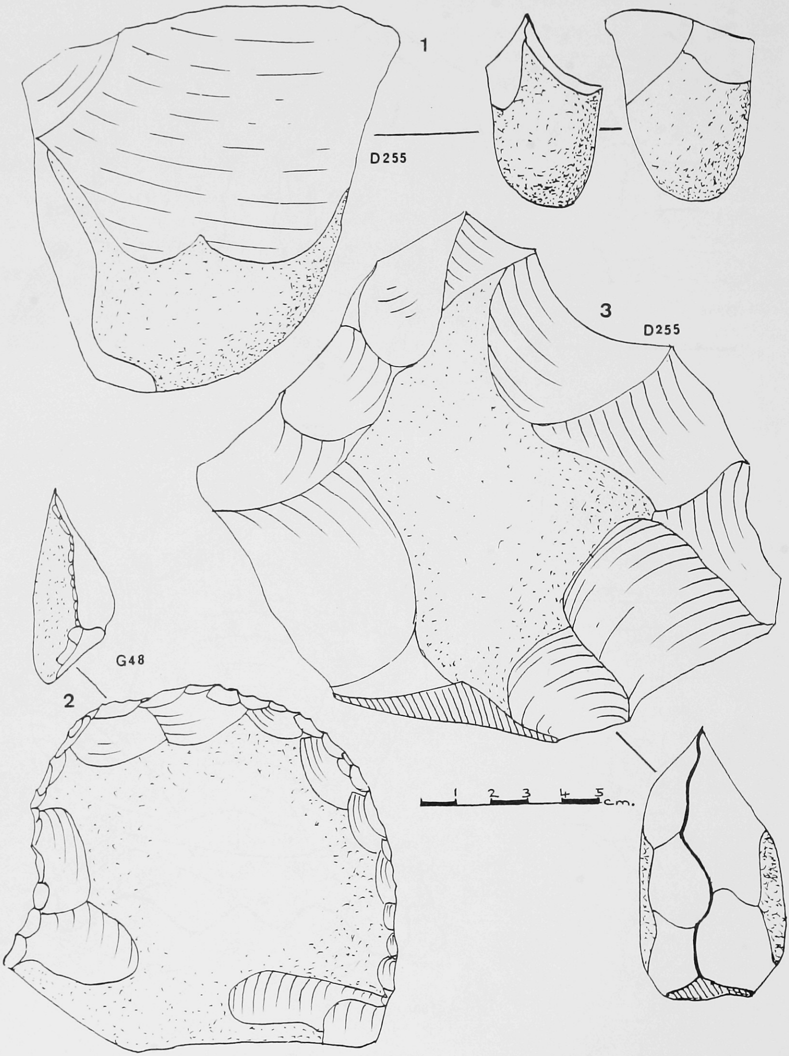



Fig.C.14. Level C. Schematic sketches of artifacts in the Beirut collection: 1) Pebble chopping-tool on a beach pebble. 11.2 x 10.9 x 8.2cm. 2) Massive scraper, type A (i.e. with thin scraping-edge) on a Nummulitic cortex-flake; profile shown half-size. The three-sided edge is semi-abruptly retouched. 3) Massive discoidal chopping-tool on a tabular slab, with the butt end formed by an older cleavage surface; alternate primary removals almost all round form a sinuous ridge with a point opposite the base; note that the profile and reverse views of no.1 and the profile views of 2 and 3 are all further reduced by a half.

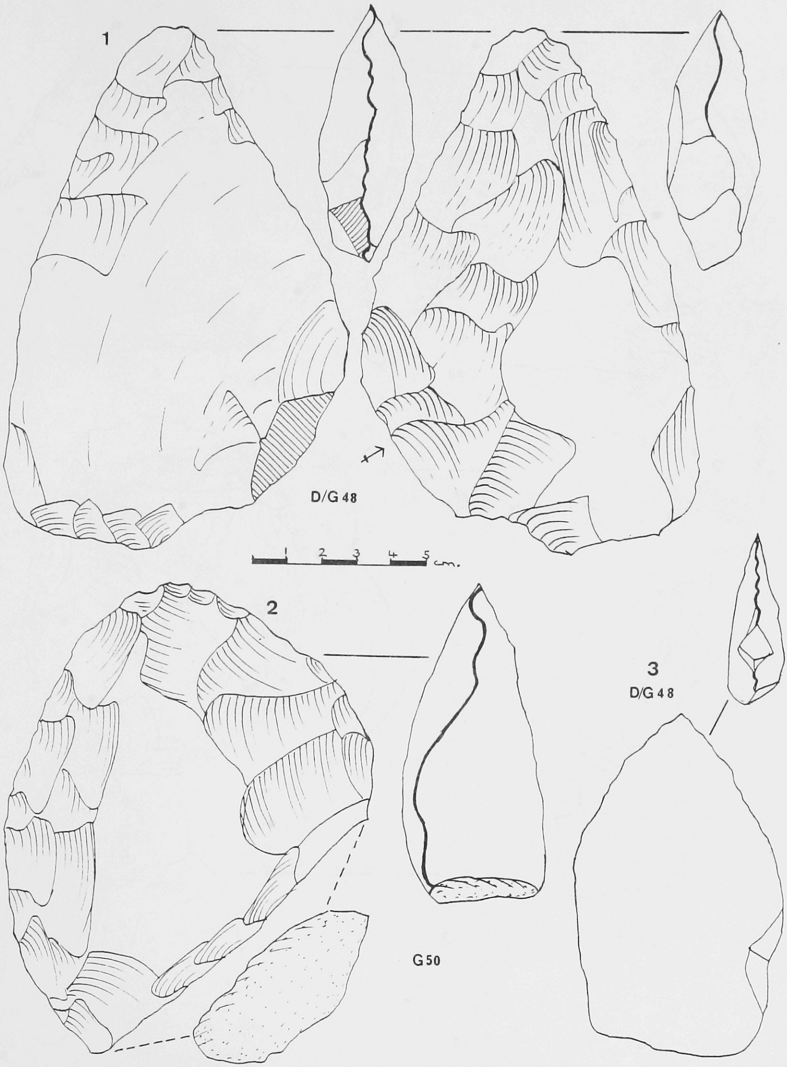



Fig.C.15. Level C. Schematic sketches of artifacts in the Beirut collection: 1) Lanceolate or partial biface on a flake; the left edge in the left-hand view is generally straight but the right edge is distal only and ends in a méplat, the butt of the face forming a 'back'. 2) Subtriangular biface (ogivo-triangular type) with flat cortex base upon which the piece will stand up. Careful flaking on the edges only. 3) Outline and profile of a sub-ovate biface (pointed ovate) showing the kind of irregularities which define this category. The profile view shows méplats. Note: all the profile views are further reduced by a half.

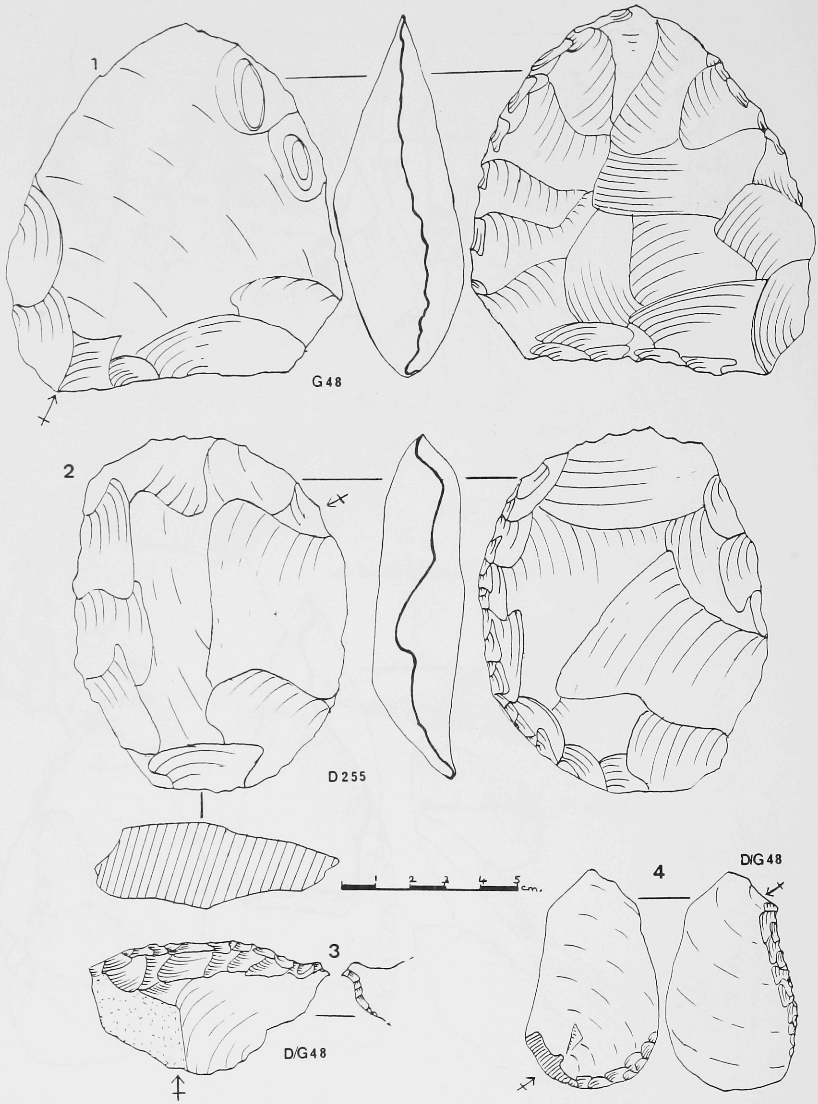



Fig.C.16. Level C. Schematic sketches of artifacts in the Beirut collection. 1) Subtriangular biface on a flake, tending toward a bifacial racloir or partial biface, to show the kind of piece for which there are alternative classifications. 2) Bifacial racloir, tranchoir type, which is also a racloir with thinned back (left side of short profile); the racloir edge is made on butt end of a flake. Long profile shows the 'back' edge. 3) Bec burinant/ transverse convex racloir composite; made on a small cortex-flake (position of butt arrowed). 4) Racloir with alternate retouch, made on a variety of Kombewa or Janus flake, with flake-surfaces on both sides, and a bulb at each extremity (indicated by arrows); in the case of the uppermost bulb, the retouch has removed most of it.

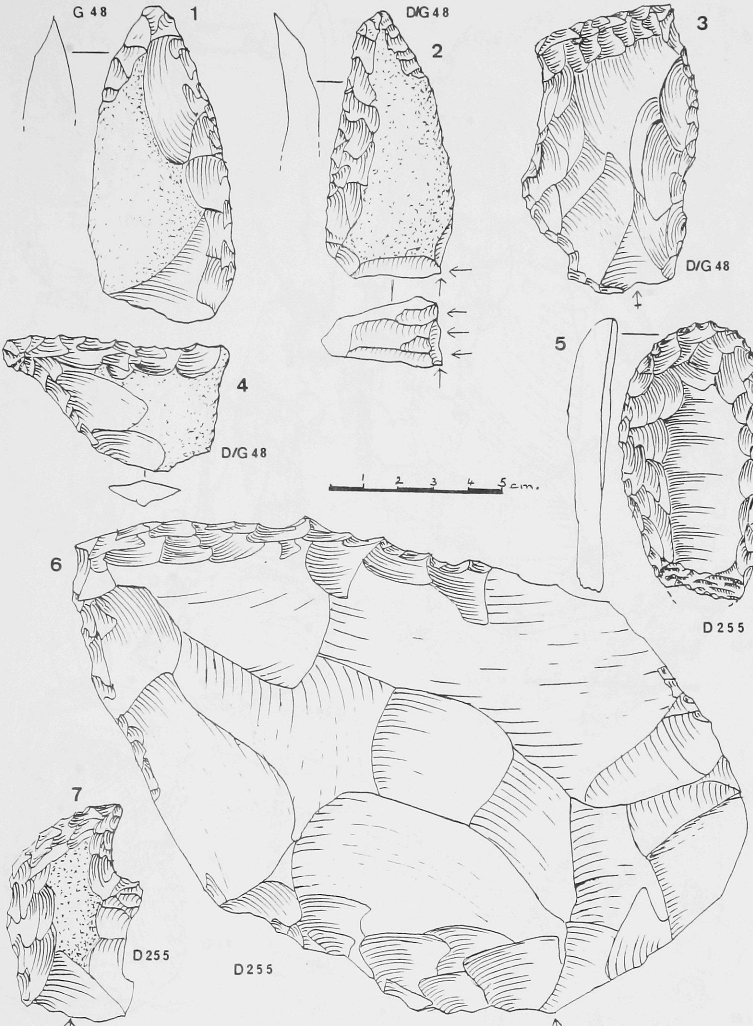



Fig.C.17. Level C. Schematic sketches of artifacts in the Beirut collection. 1) Convergent biconvex racloir, Bezez type; described in the text, pp.129-30. 2) Composite of convergent racloir, Bezez type, and burin; described in the text, pp.129-30. 3) Convergent racloir, triple type, on an end-bulb flake; retouch is thin and flat, sub-parallel at the distal end. 4) Offset racloir with demi-Quina retouch on a cortex flake; the acute angle is unusual in being in fact rounded like a nosed end-scraper. 5) End-scraper/ biconvex racloir composite on a flake, the butt end of which is burned. Alternatively, this piece could be classified as a convergent biconvex racloir. 6) Massive transverse convex racloir, passing to an offset racloir, on a special flake, described on p.131, with butt and bulb removed by retouch directed on to the upper surface, méplat at right extremity, and thin, pointed tip. Flake surface is not retouched. See also Fig.C.12. 7) Convergent racloir, classed as concavo/convex, but a notch near the tip forms a sort of hook. 12.5 x 21.0 x 3.8cm., the length measured on the axis of the removal blow (arrowed).

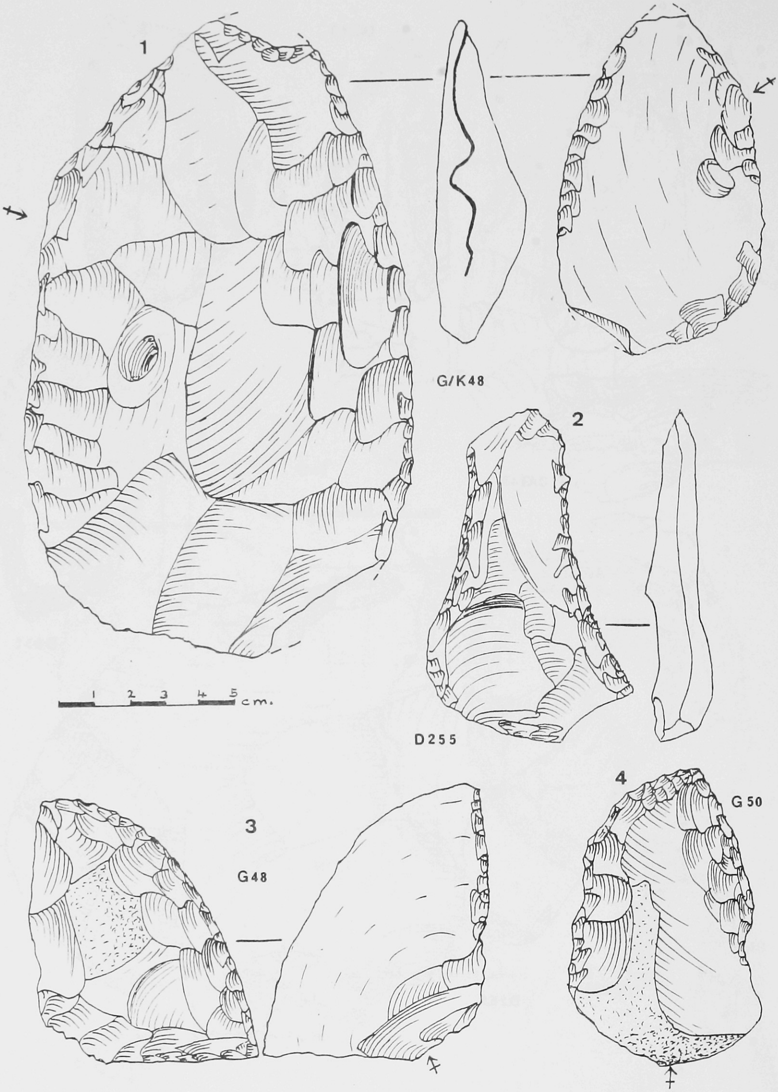



Fig.C.18a. Level C. Schematic sketches of artifacts in the Beirut collection. 1) Bifacial racloir, Quina type, on a specially prepared flake; the left-hand view shows the upper surface, with bifacial areas at the butt (left edge), arrowed, the main scraping edge (on the right) and small breaks at each extremity. The profile and flake-surface views are further reduced by a half. See also Fig.C.12. 2) Double biconvex racloir, a well-made example with thin flat retouch on a flake which was thinned over the butt on the upper surface. 3) Triple offset racloir on a transverse convex flake with two straight edges (one of them inverse) and one convex edge. Compare with no.1 on Plate C.19. 4) Typical backed knife on a cortex flake, made into a racloir and classed as a composite. The racloir retouch is fine and flat scalar, while the 'back' is abrupt, parallel (not resolved) retouch.

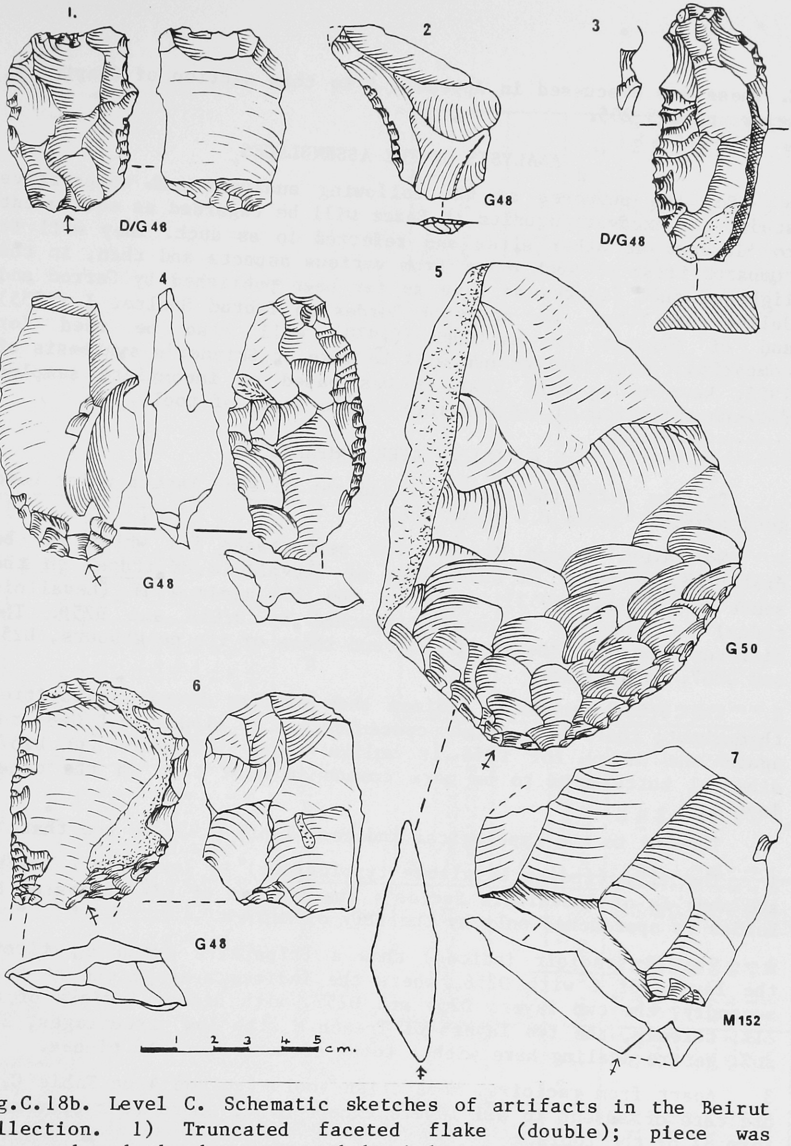



Fig.C.18b. Level C. Schematic sketches of artifacts in the Beirut collection. 1) Truncated faceted flake (double); piece was truncated and the butt removed by indirect retouch, then a flake struck off from the uppermost of the resulting platforms. 2) Single convex racloir, on a pseudo-Levallois point. 3) Denticulates with thin teeth and vertical back formed of primary preparation facets. 4) Single convex racloir, alternately retouched, of possible atypical tranchoir type; alternatively, it could be classed as a racloir with thinned back. 5) Convergent biconvex racloir, made on the butt end of a massive flake; the profile view is further reduced by a half. 6) Racloir with thinned back and single straight edge; the back is roughly bifacial, but not edged. 7) Large pseudo-Levallois flake, polygonal type, with an extended butt formed by part of the ridge of the core.

C. These are discussed in Appendix A to this section of Chapter 4, below, pp.195-205.

## ANALYSIS OF THE ASSEMBLAGES

For the purposes of the following analyses and comparative study, the excavation units in Bezez will be regarded as equivalent to 'layers' at other sites and referred to as such. They will be compared first to each other from various aspects and then, in the light of such figures as have so far been published by Garrod and Jelinek, to Tabun. The study of Bordes on Yabrud Shelter I (1955) and of Skinner on Masloukh (1970) will also be used for comparison. More limited use will be made of Skinner's synthesis of 1965, keeping in mind that it was based on incomplete samples (museum collections) and confined to the study of tools.

### A. INTER LAYER COMPARISONS

To take first the technical indices on some layers which have good samples, Table C.8 shows that:

1 No layer, except M157-8, the percentages for which may be distorted, contains an assemblage of "Levallois débitage" in the sense of Bordes (1953); however, the 20% minimum IL (Levallois index) he suggests is nearly reached by D/G48 and D256. The difference between the IL of D256 and those of its neighbours, D255 and D257, is apparent.

2 The other technical indices show similar broad similarities throughout; there is a slight concentration of blades in D/G48, and again the index for D256 is unlike those for D255 and D257; dihedral butts seem to be more common in M152 than in the other layers.

Turning to the typological indices (Table C.9), we see that:

1 The ILTy (indice Levallois typologique) is low in all layers and none is of "Levallois facies": the minimum of 28% suggested by Bordes is approached only by the ILTy of M157-8.

2 The IR (racloir indices) show a tripartite grouping; first, the layers of G with D256, where the indices average out at 56%; secondly, the two layers D255 and D257, with higher indices of c. 71%; thirdly, the two layers of Trench M with low percentages, 24-36%. We are dealing here with a total of more than 450 pieces.

3 Apart from racloirs, Mousterian tools (column 4 on Table C.9) are rare or absent in all layers except M152, where four specimens form 8% of the tools.

4 Upper Palaoelithic tools (col.5 in Table C.9) are present in all layers, even if in low number (4 - 11%). Backed knives (col.7) are rare except in M152 where 3 pieces form 6.6% of the tools.

5 The bifaces (column 8) form two rather than three groups, with Trenches M and G having percentages of 13% real (or 14% essential) to 20% real (or 16% essential), while lower indices occur in D255 and D257. The indices of the two latter are again similar, and they differ from that of D256; however, smaller samples are involved here.

| Layer | IL Levallois index | | | IFs Restricted faceting index | | | IFl Enlarged faceting index | | | ILam Blade index | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | no. | no. in class | % | no. | no. in cl. | % | no. | no. in cl. | % | no. | no. in cl. | % |
| G50 | 2 | 39 | 5.1 | 3 | 50 | 6.0 | 5 | 50 | 10.0 | 11 | 59 | 18.6 |
| G48 | 14 | 180 | 7.8 | 18 | 134 | 13.4 | 23 | 134 | 17.2 | 26 | 180 | 14.4 |
| G/K48 | 5 | 70 | 7.1 | 7 | 51 | 13.7 | 8 | 51 | 15.7 | 4 | 70 | 5.7 |
| D/G48 | 29 | 173 | 16.8 | 27 | 135 | 20.0 | 31 | 135 | 23.0 | 43 | 173 | 24.9 |
| D256 | 13 | 79 | 16.5 | 11 | 58 | 19.0 | 12 | 58 | 20.7 | 15 | 79 | 19.0 |
| D255 | 9 | 171 | 5.3 | 16 | 119 | 13.4 | 16 | 119 | 13.4 | 19 | 171 | 11.1 |
| D257 | 4 | 74 | 5.4 | 8 | 51 | 15.7 | 9 | 51 | 17.6 | 9 | 74 | 12.2 |
| M152 | 7 | 61 | 11.5 | 9 | 46 | 19.6 | 14 | 46 | 30.4 | 16 | 61 | 26.2 |
| M157-8 | 7 | 30 | 23.3 | 14 | 23 | 60.9 | 14 | 23 | 60.9 | 10 | 30 | 33.3 |

Table C.8: Bezez, Level C: Technical indices of nine layers in Level C.

| Column number | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Index | Real ILTy & I | | | Real IR | | | Essential IR | | | Essential II (restricted) | | | Essential III | | | Essential IV | | | Essential Au | | | Real IBif | | |
| Bordes' Type numbers | 1-4 | | | 9-29 | | | 9-29 | | | 5-8 | | | 30-37 | | | 43 | | | 36-37 | | | Bifaces | | |
| Layers | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % |
| G50 | 1 | 67 | 1.5 | 33 | 67 | 49.3 | 33 | 64 | 51.6 | 2 | 64 | 3.1 | 3 | 64 | 4.7 | 2 | 64 | 3.1 | 1 | 64 | 1.6 | 14 | 67 | 20.9 |
| G48 | 8 | 198 | 4.0 | 98 | 198 | 49.5 | 98 | 181 | 54.1 | 3 | 181 | 1.7 | 8 | 181 | 4.4 | 13 | 181 | 7.2 | 2 | 181 | 1.1 | 41 | 198 | 20.7 |
| G/K48 | 1 | 68 | 1.5 | 40 | 68 | 58.8 | 40 | 64 | 62.5 | 1 | 64 | 1.6 | 3 | 64 | 4.7 | 6 | 64 | 9.4 | 2 | 64 | 3.1 | 9 | 68 | 13.2 |
| D/G48 | 17 | 178 | 9.5 | 86 | 178 | 48.3 | 86 | 150 | 57.3 | - | | | 11 | 150 | 7.3 | 11 | 150 | 7.3 | 2 | 150 | 1.3 | 29 | 178 | 16.3 |
| D256 | 11 | 76 | 14.4 | 29 | 76 | 38.1 | 29 | 62 | 46.8 | 2 | 62 | 3.2 | 8 | 62 | 12.9 | 2 | 62 | 3.2 | 1 | 62 | 1.6 | 10 | 76 | 13.3 |
| D255 | 3 | 171 | 1.8 | 117 | 171 | 68.4 | 117 | 164 | 71.3 | 2 | 164 | 1.2 | 7 | 164 | 4.3 | 2 | 164 | 1.2 | 2 | 164 | 1.2 | 14 | 171 | 8.2 |
| D257 | 3 | 70 | 4.3 | 46 | 70 | 65.7 | 46 | 65 | 70.8 | 3 | 65 | 4.6 | 2 | 65 | 3.1 | 2 | 65 | 3.1 | 1 | 65 | 1.5 | 8 | 70 | 11.6 |
| M152 | 4 | 50 | 8.0 | 11 | 50 | 22.0 | 11 | 45 | 24.4 | 4 | 45 | 8.9 | 6 | 45 | 13.3 | 3 | 45 | 6.7 | 3 | 45 | 6.7 | 7 | 50 | 14.0 |
| M157-8 | 5 | 26 | 19.2 | 7 | 26 | 27.0 | 7 | 19 | 36.8 | - | | | - | | | 1 | 19 | 5.3 | - | | | 5 | 26 | 19.2 |

Table C.9: Bezez, Level C: Typological indices of nine layers in Level C, after the system of Bordes (1961).

| "Essential" tool list — Layers | G50 | | G48 | | D/G48 | | G/K48 | | D255 | | D256 | | D257 | | M152 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bordes number and type | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| 4. Retouched Levallois points, and flakes | | | 1 | 0.7 | 2 | 1 6. | | | | | | | 1 | 2.1 | 2 | 5.0 |
| 5. Pseudo-Levallois points | | | | | | | | | | | 1 | 2.1 | | | 4 | 10.0 |
| 6. Mousterian points | | | 1 | 0.7 | | | | | 2 | 1.4 | | | | | | |
| 7. Elongated Mousterian points | | | | | | | | | | | | | | | | |
| 8. <u>Limaces</u> | 2 | 4.2 | 2 | 1.4 | | | 1 | 1.9 | | | 1 | 2.1 | 3 | 6.2 | | |
| 9. <u>Racloirs</u>: Single straight, excluding fragments | 3 | 6.2 | 12 | 8.6 | 6 | 4.7 | 3 | 5.7 | 15 | 10.4 | 2 | 4.3 | 7 | 14.6 | 4 | 10.0 |
| 10. single convex, excluding fragments | 9 | 18.7 | 21 | 15.0 | 17 | 13.3 | 12 | 22.6 | 30 | 20.8 | 7 | 14.9 | 11 | 22.9 | 1 | 2.5 |
| 11. single concave, excluding fragments | | | 2 | 1.4 | 2 | 1.6 | | | 3 | 2.1 | 1 | 2.1 | 1 | 2.1 | | |
| 12-17. double | 7 | 14.6 | 14 | 10.0 | 13 | 10.2 | 3 | 5.7 | 15 | 10.4 | 5 | 10.6 | 1 | 2.1 | | |
| 18-20. convergent | 4 | 8.3 | 10 | 7.1 | 13 | 10.2 | 7 | 13.2 | 13 | 9.0 | 2 | 4.3 | 5 | 10.4 | 1 | 2.5 |
| 21. offset and triple | 3 | 6.2 | 11 | 7.9 | 8 | 6.2 | 3 | 5.7 | 11 | 7.6 | 5 | 10.6 | 3 | 6.2 | 2 | 5.0 |
| 22-24. transverse | 3 | 6.2 | 12 | 8.6 | 12 | 9.4 | 7 | 13.2 | 15 | 10.4 | 3 | 6.4 | 4 | 8.3 | | |
| 25. inversely retouched | 1 | 2.1 | 4 | 2.9 | 2 | 1.6 | 1 | 1.9 | | | | | 1 | 2.1 | 1 | 2.5 |
| 26. abruptly retouched | 1 | 2.1 | 2 | 1.4 | 1 | 0.8 | | | | | 1 | 2.1 | | | | |
| 27. with thinned back | | | 2 | 1.4 | 1 | 0.8 | 1 | 1.9 | 1 | 0.7 | | | 1 | 2.1 | | |
| 28. bifacially retouched | | | 8 | 5.7 | 4 | 3.1 | 2 | 3.8 | 6 | 4.2 | 2 | 4.3 | | | 2 | 5.0 |
| 29. alternately retouched | | | | | 4 | 3.1 | 1 | 1.9 | 3 | 2.1 | | | 1 | 2.1 | | |
| 30. Typical end-scrapers | | | 1 | 0.7 | 2 | 1.6 | | | 2 | 1.4 | | | | | | |
| 31. Atypical end-scrapers and composites | | | 1 | 0.7 | 2 | 1.6 | 1 | 1.9 | 1 | 0.7 | | | | | | |
| 32. Typical burins | 1 | 2.1 | 3 | 2.1 | 1 | 0.8 | | | 1 | 0.7 | 3 | 6.4 | | | 1 | 2.5 |
| 33. Atypical burins and composites | 1 | 2.1 | | | 4 | 3.1 | | | 1 | 0.7 | 3 | 6.4 | 1 | 2.1 | 2 | 5.0 |
| 34. Typical perforators | | | 1 | 0.7 | | | | | | | | | | | | |
| 35. Atypical perforators | | | | | | | | | | | | | | | | |
| 36. Typical backed knives | | | | | 1 | 0.8 | | | 1 | 0.7 | 1 | 2.1 | 1 | 2.1 | | |
| 37. Atypical backed knives and composites | 1 | 2.1 | 3 | 2.1 | 1 | 0.8 | 2 | 3.8 | 1 | 0.7 | | | | | 3 | 7.5 |
| 38. Naturally-backed knives | 1 | 2.1 | | | 6 | 4.7 | | | 1 | 0.7 | 2 | 4.3 | 2 | 4.2 | 5 | 12.5 |
| 39. <u>Raclettes</u> | | | | | | | | | | | | | | | | |
| 40. Truncated pieces | 1 | 2.1 | 2 | 1.4 | | | | | | | | | | | 1 | 2.5 |
| 41. Mousterian <u>tranchet</u> | | | | | | | | | | | | | | | | |
| 42. Notched pieces | 1 | 2.1 | 4 | 2.9 | 6 | 4.7 | 1 | 1.9 | 1 | 0.7 | 1 | 2.1 | | | 1 | 2.5 |
| 43. Denticulates | 2 | 4.2 | 13 | 9.3 | 11 | 8.6 | 6 | 11.3 | 2 | 1.4 | 2 | 4.3 | 2 | 4.2 | 3 | 7.5 |
| 44-46. <u>Becs burinants</u>, inverse and abrupt retouch | 1 | 2.1 | 1 | 0.7 | 1 | 0.8 | | | | | | | | | | |
| 47-50. Abrupt/alternate, thick/thin retouch | | | | | | | | | | | | | | | | |
| 51. Tayac point | | | | | | | | | | | | | | | | |
| 52. Notched triangle | | | | | | | | | | | | | | | | |
| 53. Pseudo-microburin | | | | | | | | | | | | | | | | |
| 54. Distally notched pieces | | | 1 | 0.7 | | | 2 | 3.8 | | | | | | | | |
| 55. Cleaver | | | | | | | | | | | | | | | | |
| 56. <u>Rabot</u>, massive scraper, disc | 1 | 2.1 | | | 4 | 3.1 | | | 5 | 3.5 | 1 | 2.1 | 2 | 4.2 | 1 | 2.5 |
| 57. Tanged piece | | | | | | | | | | | | | | | | |
| 58. Tanged piece | | | | | | | | | | | | | | | | |
| 59. Chopper | 1 | 2.1 | | | | | | | 2 | 1.4 | | | | | | |
| 60. Inverse chopper | | | | | 1 | 0.8 | | | 1 | 0.7 | | | | | | |
| 61. Chopping-tools | 4 | 8.3 | 7 | 5.0 | 2 | 1.6 | | | 8 | 5.6 | 4 | 8.5 | 1 | 2.1 | 6 | 15.0 |
| 62. Divers | | | 1 | 0.7 | 1 | 0.8 | | | 3 | 2.1 | | | | | | |
| 63. Foliate pieces | | | | | | | | | | | | | | | | |
| Totals | 48 | 100.0 | 140 | 99.8 | 128 | 100.4 | 53 | 100.2 | 144 | 100.1 | 47 | 100.0 | 48 | 100.1 | 40 | 100.0 |

Table C.10: Tools from eight layers of Level C, arranged into the order used in cumulative diagrams after the method of F. Bordes (1961)

6 Quina retouch occurs in fairly random proportions, with the exception of the Trench M indices, where this attribute is far less prevalent (p.126).

In sum, the technical indices show a fair degree of homogeneity, while there is a tripartite division of the typological proportions in the layers, in general corresponding to the three trenches; the most important differences are found in the biface/racloir ratios, as shown in Table C.9b, column 2.

Cumulative graphs were drawn up for layers with adequate samples, to assist in internal comparisons, as well as in comparisons with similarly-analysed Yabrudian layers at Tabun and Yabrud Shelter I (Figs.C.19a-d). This course was followed in full awareness of the now well-recognised arbitrary nature of the method, in which the ordering makes the graph an artifact in its own right, in which chopping-tools and rabots are admitted but bifaces excluded, and bearing in mind that the method was designed by Bordes for use with French Mousterian facies.

Table C.10 shows percentages resulting from the rearrangement of Level C material into the order of Bordes' "essential" list, from which unretouched Levallois pieces, irregularly retouched pieces (nos.47-50), bifaces, picks and polyhedrons are omitted.

We may summarise the results as follows:

1 The pronounced convexity of the curves for D255 and D257, even without the addition of the fragmentary racloirs to the percentages, again characterises this group, as already indicated by the indices. The curves resemble those of the Yabrudian levels at Yabrud I, which according to Bordes (1955, pp.498 and 505) are closely comparable, although not identical, to the graphs of the Quina Mousterian or Charentian industries of France; see also his comments (*ibid.*, p.498) on the difference between the two facies. Characteristically, on Fig.C.19a the vertical cumulative value has already reached c. 70% at the position on the horizontal abscissa of category 21 (offset racloirs). However, Level C layers have many more single and double racloirs than the 'typical' Yabrudian level, 22, at Yabrud I, and they more resemble level 11 at Yabrud I, an Acheuleo-Yabrudian level (Bordes' Figs.1 and 4, *ibid.*, and our Fig.C.19b). Of this latter facies, Bordes notes that 'Le diagramme le classe nettement dans le Jabrudian' (*ibid.*, p.492) in spite of the presence of 6% bifaces (a percentage comparable to those of Bezez Trench D). Thus, if Yabrud I is used as a model, this group may be termed Acheuleo-Yabrudian, of a type very close to the Yabrudian. Fig.C.19b also shows the essential graph for Bed 48A (now called bed 75S) at Tabun, which can be seen to accord closely with that for D255, except for its higher number of naturally-backed knives; in this area it more resembles M152.

2 The diagram for M152 (Fig.C.19c) differs from those of the other layers to a degree which surpasses any mere distortion resulting from the small sample size. The difference is mainly due to the scarcity of racloirs in M152, which takes this layer out of the 'pure' Yabrudian (as known from Yabrud I, 22) range, even though offset racloirs are present. In the same figure, M152 is compared to two layers at Yabrud I: level 23, an Acheulean, and

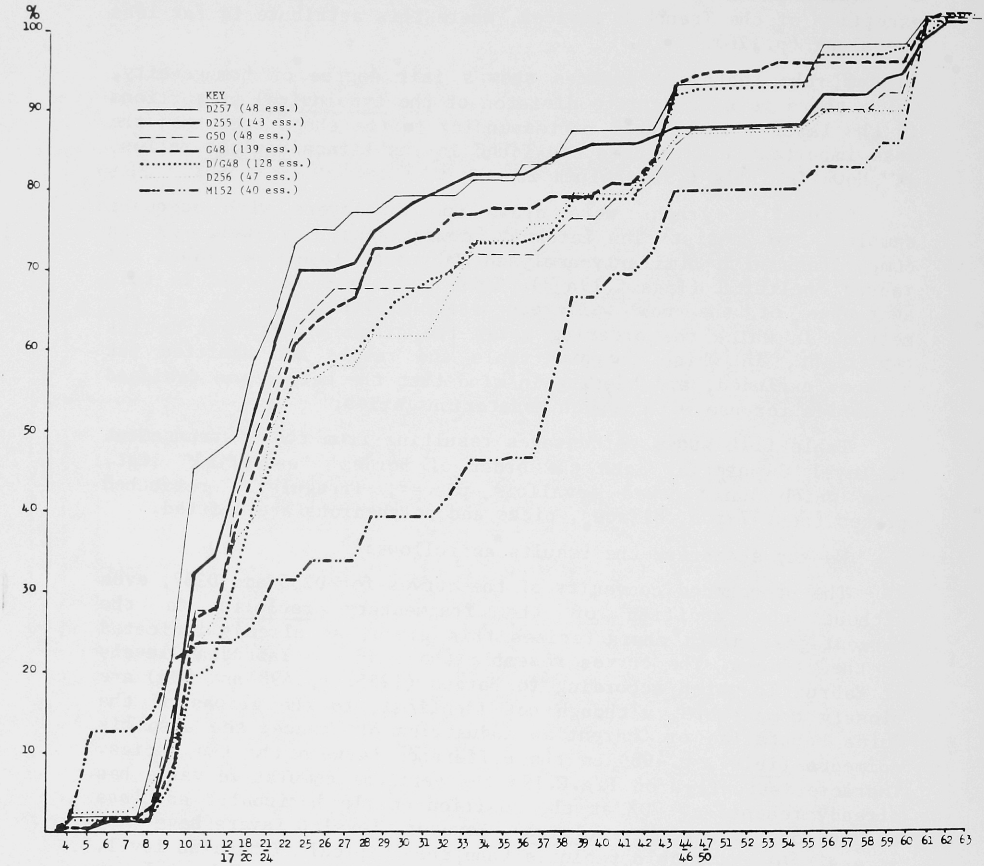



Fig.C.19a. Cumulative graphs comparing the frequency of 'essential' tool-types in seven layers of Level C. After the method of Bordes, 1961.

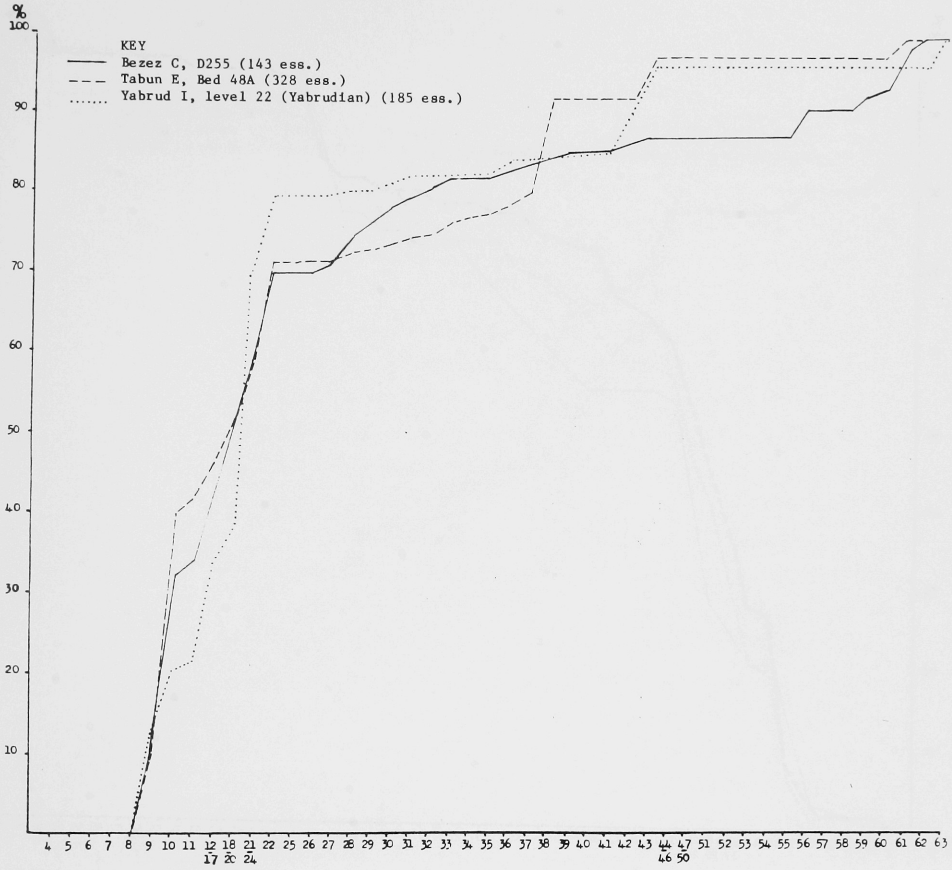



Fig.C.19b. Cumulative graphs in the manner of Bordes (1961) comparing the frequency of essential tool-types in Bezez C, layer D255, Tabun, Bed 48A (Jelinek, 1975) and Yabrud I, level 22 (Bordes, 1955).

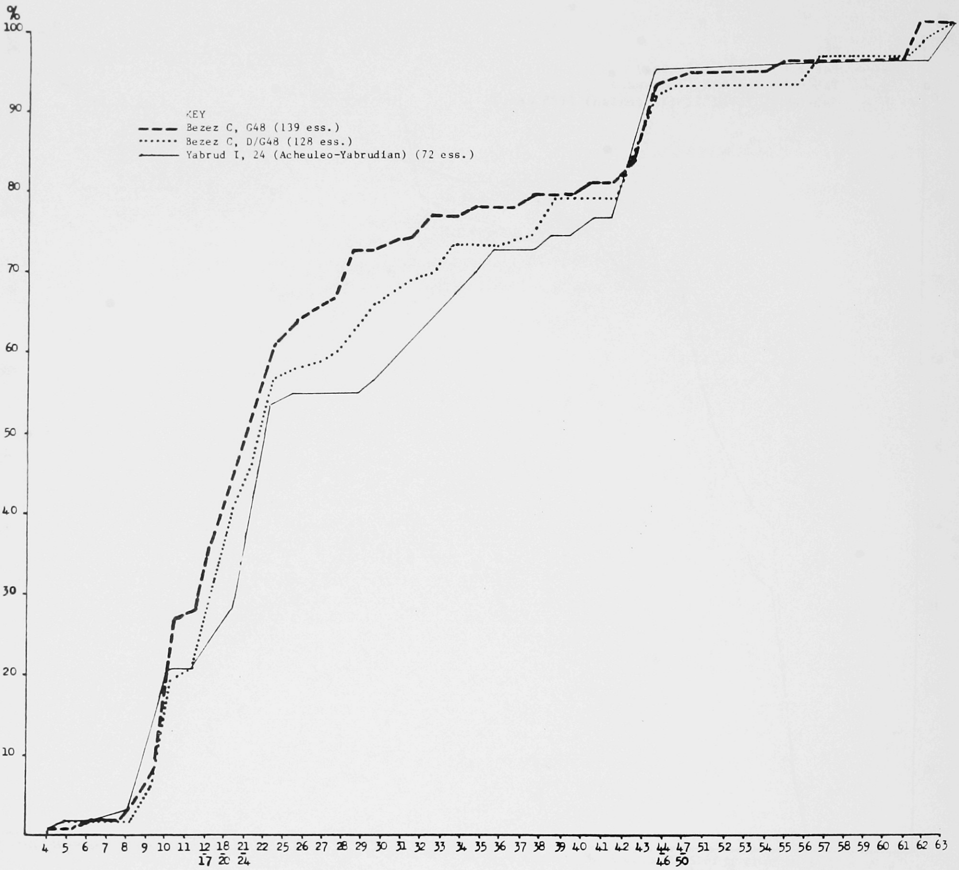



Fig.C.19c. Cumulative graphs comparing frequency percentages of 'essential' tool-types in the manner of Bordes (1961), in two layers in Level C, compared to those of Yabrud I, level 24, as analysed by Bordes (1955).

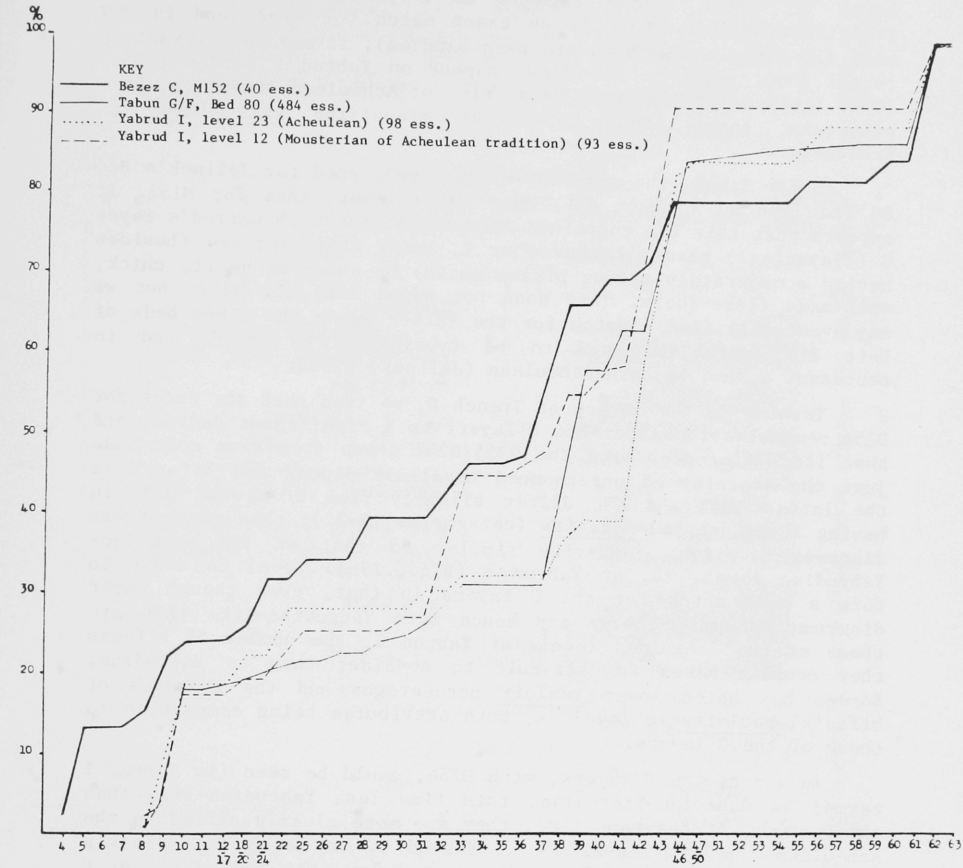



Fig.C.19d. Cumulative graphs in the manner of Bordes, 1961, comparing frequency of 'essential' tool-types in Bezez C, layer M152, two levels at Yabrud I (Bordes, 1955), and Bed 80 at Tabun (Jelinek, 1975).

level 12, which Bordes regards as a Mousterian of Yabrudian tradition. While neither is an exact match for M152 (and in any case all three assemblages are poor samples), it may be relevant to recall that, while in his first papers on Yabrud I Bordes (1955; 1958) likened level 12 to a Mousterian of Acheulean tradition, in a subsequent paper (1960, p.93) he classified this level as Acheulean.

As for Tabun, the cumulative graph published for Jelinek's Bed 80 (now Bed 90 in Unit XIV) does not resemble that for M152. It appears that this bed contained more affinities with Garrod's layer G ('Tayacian') than with her F or E, being characterised (besides having a moderately strong biface ratio) by numerous small, thick, well-made flake-tools. This does not sound like our M152, but we may eventually find a match for the latter among the other beds of Unit XIV, which is said to be typologically varied, and to represent a kind of Late Acheulean (Jelinek, 1981).

3 Turning to the layers of Trench G, we find that the curve for D256 resembles those for the G layers to a significant degree, and that its differences from the D255/D257 group stem from more than just the scarcity of unretouched Levallois pieces and bifaces in the latter. G48 and G50 differ slightly from D/G48 and D256 in having fewer special <u>racloirs</u> (categories 18-22); this gives their diagrams a slight concavity similar to that of the Acheuleo-Yabrudian level, 24, at Yabrud I (Fig.C.19c). Level 24 seems to form a good match for the G layers in that, even though their diagrams are more convex and hence more Yabrudian-like than are those of the Acheulean levels at Yabrud I, the number of bifaces they contain makes it difficult to consider them as Yabrudian. Bordes has noted lower <u>racloir</u> percentages and the presence of bifacial <u>racloirs</u> in level 24, both attributes being comparable to those of the G layers.

In short, the G layers, with D256, could be seen (in Yabrud I terms) as Acheuleo-Yabrudian, this time less Yabrudian-like than the D group. At the same time, they are more clearly allied to the Acheulean than was level 24 at Yabrud I. In terms of Jelinek's Mugharan Tradition at Tabun, discussed below, the facies in our G layers and D256 would no doubt find a match in one or several of the beds in Units XIII-X, where, as Jelinek has recently remarked, clear examples of 'Acheulean', 'Yabrudian' (<u>sensu stricto</u>) and 'Acheuleo-Yabrudian' industries can be distinguished (Jelinek, 1981).

Since all the above analyses are selective, histograms showing the actual composition of the representative layers were drawn up (Fig.C.20). Although the figure is more diffuse visually, certain internal variations in the layers can be observed, for example G/K48 is singularly low in burins and end-scrapers.

To sum up the results so far, it appears that broadly similar assemblages occur in all the layers, so far as technical and stylistic attributes are concerned, but that three groups can still be distinguished, based on typological criteria; these extend laterally along the main axis of the cave and correspond to the three trenches D, G and M, the only exception being D256.

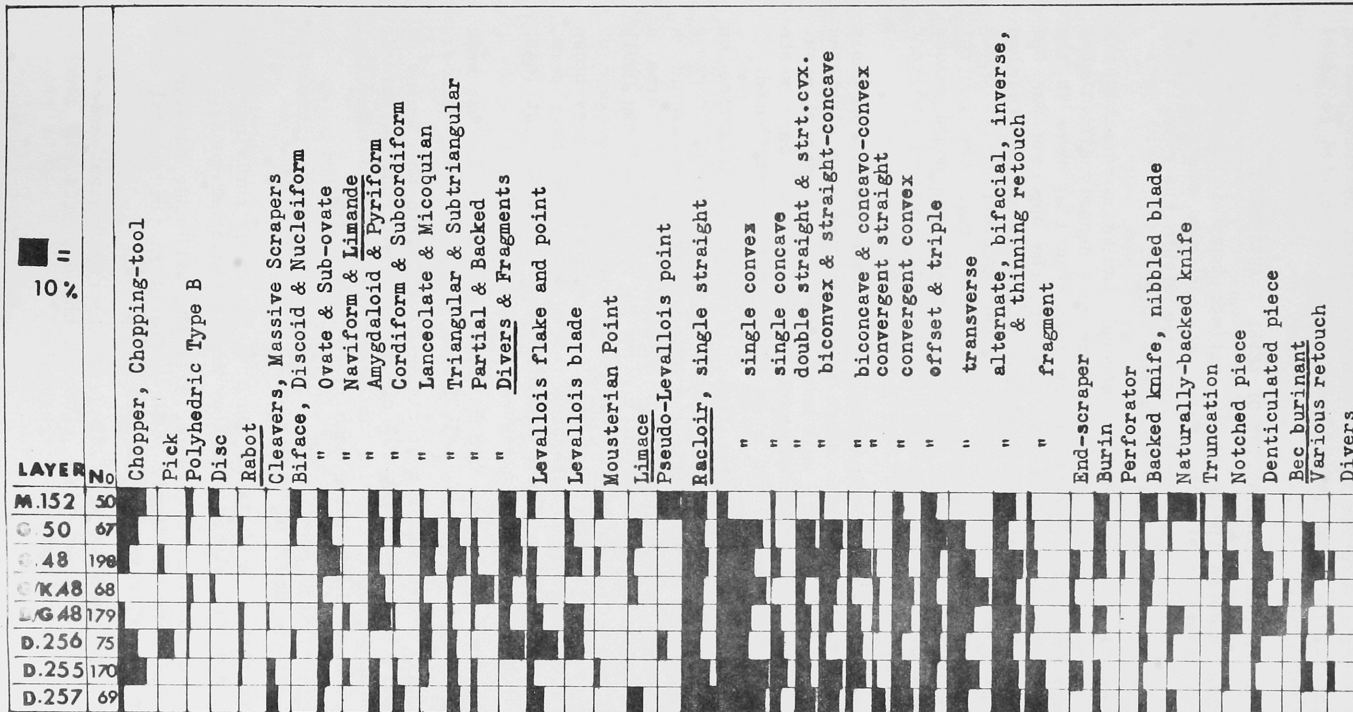



Fig.C.20. Histograms showing real percentages of tool-types (some groups) in eight layers of Level C. Layers with poor samples are not presented.

As an interim solution to the problems raised by this reading of the material, the term 'Acheuleo-Yabrudian' is applied to Level C as a whole.

## B. SPATIAL DISTRIBUTION OF LEVEL C ARTIFACTS

Having considered the types of artifact found in Level C and the kind of assemblages they form, we can now examine their disposition in relation to the living-space within the cave, which must have consisted of roughly 600 square metres.

In spite of the presence of several baulks separating the units, it seems clear that artifacts were more densely distributed in the mouth and central areas of the cave than they were in the rear; as we shall see in the next chapter, the opposite was the case in Level B. The central area (the G complex of layers) had 58.5% of the 2,046 artifacts retained after excavation; the mouth area (layers of Trench D) had 31.4%. Given that the central exposure is twice the size of that at the mouth, one could assume that the true density was greatest in the mouth area; at the rear (Trench M) only 8.9% of the artifacts were found.

As regards artifact categories, the greatest density of tools (as against waste) was in the mouth area; racloirs also clustered heavily there, while bifaces were more dense in the central area. Levallois pieces were slightly more common in the rear; waste flakes, blades and cores seemed to be fairly evenly distributed.

It is necessary to stress that, as noted by Kirkbride on pp.26-32, the change in tool proportions between layers of Trenches D and G appears to occur within the same stratum as excavated: a yellowish to grey-brown deposit c. 8 - 10 cm. thick forms a distinctive geological horizon which seems to run through the baulk D/G. On the western side of this baulk we have the assemblage of D255 while on the opposite side, also in a yellowish to grey-brown horizon, is the different assemblage of D/G48. As we have seen, these layers represent separate archaeological "facies" - at least they have been distinguished elsewhere as such.

However that may be, something can be said as to the use made by the Acheuleo-Yabrudians of their living space in Level C times:

1 They built fires in or near the entrance, into which many of their racloirs fell (at least 12% of Trench D material is burned, and more unrecognisable material was discarded); it is assumed that the cave mouth was in much the same place then as now.

2 They performed many tasks, particularly those involving racloirs, near the mouth of the cave.

3 They performed fewer tasks near the entrance involving heavy-duty tools, cores or blades than they did in the other zones.

4 They used more bifaces, especially the well-made and typical specimens, and correspondingly fewer racloirs in the central area (bifacial racloirs, however, being an exception).

5 They do not seem to have lit fires in the central area very often (only 6% burnt material, although the deposits did contain one hearth and many fragments of carbon).

6 They knapped flint to some extent in the central area.

7 They used a wider variety of tools in the centre area than in the entrance (G/K48, an exception, is in a peripheral position against the cave wall).

8 They evidently knapped flint at the back of the cave, judging by the relative abundance of cores, unretouched flakes and blades in this area.

9 They appear to have either utilised heavy-duty tools in the rear, or to have exploited the beach pebbles conveniently loose here, to knap flint.

10 They probably did not light fires in the rear area of the cave (only 3% burnt material).

11 They probably did not use the rear area for jobs involving finished tools. (Could it have been used, for example, as a sleeping area, since it is darker and narrower than the rest of the cave, and has some raised, shelved spaces?) Alternatively, it could have been used only intermittently during the span of the Acheuleo-Yabrudian occupation.

Our interpretation of these indications is postponed until the final chapter, pp.415-22.

## C. REGIONAL COMPARISONS

Since Bezez was excavated, work at contemporary sites has made available much comparative material; Tabun, Yabrud I and Zuttiyeh have all been excavated for a second time (Jelinek, 1981; Solecki and Solecki, 1966; Gissis and Bar Yosef, 1974), and a new site, Masloukh, discovered by Sanlaville and excavated by Skinner (1970) also produced artifacts of the Yabrudian phase. Seven mound-springs in the El-Koum basin (Central Syria) have recently yielded dated Yabrudian material (Copeland and Hours, 1981, p.228), opening up a new view of its date and distribution; one site, Hummal, had an almost pure Yabrudian, with only 2 bifaces for c. 600 other artifacts (pers.comm. F. Hours, 1982). The stratigraphic position of the Yabrudian - found under Levalloiso-Mousterian at all these sites and over Acheulean at Tabun and Yabrud - 'places' the Yabrudian culturally at the transition between the Lower and Middle Palaeolithic. As to its date, a Uranium series date of 148,000 ± 6 ka was obtained for the lower, Acheuleo-Yabrudian, layer at Zuttiyeh Cave (sample ZU4, Schwarcz et al., in press); this seemed to be too early, but has since been broadly corroborated by some Th230/U234 dates obtained by the Cologne laboratory for artifact-bearing travertines at El-Koum, Syria: 156,000 ± 15 ka for the Yabrudian layer at Hummal Ib, and 139,000 ± 16 ka for an Acheuleo/Yabrudian layer at Oumm Tleil, among several other dates. The two dates mentioned are regarded by Cologne as 'highly reliable' (pers.comm. G. Henning, 1982).

### BEZEZ C, TABUN F-E AND MASLOUKH

Tabun is 80km. to the south, and Masloukh 110km. to the north of Bezez Cave; all three are karstic formations in the lower limestone slopes of the Lebanon/Galilee/Carmel mountain range at

its junction with the coastal plain. All three consist of the remains of galleries, connected by chimneys and, in the case of Tabun and Bezez, by swallowholes. All three open in a cliff-line associated with fossil sea-levels higher than that of today, but here the resemblances end, for only at Bezez is the flint material directly in contact with a sea-level (of 15m., dated by Sanlaville to the middle of the Last Interglacial (see Table R.1 in Chapter 8), i.e. between the first and second phases of the Enfean Transgression).

In the case of Tabun and Masloukh, an earlier raised beach is involved, with which the Yabrudian is not directly connected; this is the 39 - 45m. pre-Enfean high sea-level which French and Israeli marine geologists date, broadly speaking, to the Penultimate or Mindel/Riss Interglacial, the Jbailian II Transgressive stage of Sanlaville (1977; 1981; see also Horowitz, 1975-77, Fig.4, p.63 and his references, e.g. Michelson, 1970; Slatkine and Rohrlich, 1966).

At Masloukh the Yabrudian is separated from the Jbailian beach by a cemented marine deposit containing a flake industry of unknown character (could it be Tayacian?), and by an unconformity, so that the Yabrudian cannot have occurred until some time in the Penultimate Glacial at the earliest. It is, of course, more likely to have occurred in the subsequent Enfean transgressive stage, contemporaneously with Bezez C.

The 39m. beach near Tabun is just 6m. below the present sill, the area of which was once perhaps the corridor between two swallowholes (Garrod and Bate, 1937, p.66); the outer, eroded cave could have been the one broken into by this high sea-level. Sometime during the post-Jbailian retreat phase, the cave was probably ready for occupation, and, as at Masloukh, the first trace of this to be deposited could have been the flake industry, the Tayacian of G, followed (unlike Masloukh) by the Late or Final Acheulean of F. After this, perhaps similar, remove in time from the Jbailian phase, both sites were occupied by the Yabrudians. To this writer it seems logical to follow what seems to be the prevailing pattern in the Levant (Sanlaville, 1981), where the Jbailian II Transgressive phase is associated with (late) Middle Acheulean and the subsequent glacial by Late Acheulean industries (see Hours, 1981 and his references) and to regard Tabun G and F as having been deposited during the Riss. On the Carmel there is a raised beach at c. 15m. a.m.s.l., correlated by Michelson and others (see references in Horowitz, 1975-77, Fig.4) with the Riss/Würm, i.e. the Enfean. During this period the cave climate would not have been greatly affected by the lower and more distant seashore, except by the continuing build-up of deposits (layer E) deriving from dune sand.* This scheme allows for Tabun E to be contemporary with Bezez C, as the typology suggests (see below).

* We know that dune formation continues during interglacials from evidence on the Levant shore today; on the Beirut sands considerable effort has been expended since Turkish times to keep the dune ridges from advancing over the city (Bergy, 1932) and from burying the International Airport runways.

However, certain aspects of the Tabun sedimentological column have suggested a lower chronology to Farrand (in Jelinek *et al.*, 1973; 1978); in this, he attributes the 39m. shoreline to the Enfean I Transgression, suggesting that differential tectonics may, by coincidence, have raised the Enfean beaches in the Mount Carmel block to the same general level as the previous (Jbailian) shorelines elsewhere in the Levant. This puts all the Tabun occupation deposits into the Enfean and Last Glacial, bringing Bezez C into the same time slot as Tabun F rather than E (1978, Fig.1, part 1), the lower part of E to Late Enfean II (*ibid.*, Fig.1, part 2) and the upper part of E and D to the post-Enfean, Naamean Transgression. Further chronological discussion is postponed to Chapter 8, but meanwhile our reservations concerning the above scheme of Farrand mean that the typological correlations between the two sites must be carefully assessed. We do not need to examine Masloukh in similar detail, since the Yabrudian deposits there were thought to have been "transported into place" (Skinner, 1970, p.148) and therefore we do not know whether one or several facies are present.

## TYPOLOGICAL COMPARISONS

We have mentioned that the first excavation at Tabun found Tayacian at the base (layer G), over which was the Late Acheulean of F, followed by Layer E; this was 4.50m. thick and was subdivided, on the basis of slight industrial shifts (Garrod, 1956, p.42), into four parts - Ed, Ec, Eb and Ea.

The whole of layer E was first termed Upper Acheulean (Micoquian), then Acheuleo-Yabrudian (Garrod, 1956). At the start, E differed from F only in degree (e.g. a reversal of the biface/*racloir* ratio: see our Fig.C.22); it then developed upwards into a flake-dominated assemblage. According to Garrod, the lower layers of E contained bifaces and offset and transverse *racloirs* in gradually shifting proportions; considerable fluctuations appeared in the middle of Eb and continued throughout Ea (*ibid.*; see her Fig.2, p.47). Also mentioned is a cache of 29 bifaces found against one wall of Tabun, and a concentration of certain flints, which was observed beside the west wall (Garrod and Bate, 1937, p.67 *et seq.*). These indications of internal and vertical variation in the areas worked by Garrod are confirmed by Jelinek's more recent excavation of the adjacent deposits. Even the first reports noted that bifaces and *racloirs* occurred throughout E, now subdivided into many smaller units and beds. In the revised stratigraphy of Jelinek (1981), those next to E are now grouped into Units XIII-XI or X, consisting of Beds 73-85; this includes the beds first published as 48A and 48B. It will be interesting to see whether one or more of these beds may correspond to our Bezez C layers, since the same types are present in fluctuating proportions, as shown on Jelinek's Fig.2, among others.

While awaiting the final data, we may comment on the typology and technology of the Tabun E material and its equivalents, as seen in four museum collections (those of the British Museum, University Museum (Cambridge), Institute of Archaeology collections (London) and University of Arizona (the latter seen thanks to the kindness

of A. Jelinek). It is on the basis of a study of these collections that the following notes are offered.

A. BIFACES

This category is particularly useful for comparisons. It soon becomes apparent that the Bezez Level C bifaces do not, as a group, resemble the rounded types so characteristic of Garrod's Tabun F or even Ed. The latter levels contain discs, nucleiform and discoid bifaces, Levallois cores, incomplete short bifaces with broad, rounded cleaver tips, finely-made chopping-tools (into which the cleavers grade), oval forms, often with thin and flat retouch; to quote Garrod and Bate, 'discs are typical of F' (1937, p.88). As we have seen, rounded forms are virtually absent in Bezez C.

However, in the upper layers of Garrod's E, there are types closely comparable to those in Bezez, such as amygdaloids (with characteristic 'stand up' bases), asymmetrical partial and backed biface types, pointed ovates and rare Micoquian forms. The proportion of ovates to other biface types seems to change through time at Tabun (Garrod and Bate, 1937, p.88), while at Bezez they are present in similar quantities throughout; data such as these may eventually contribute to the correlation of Tabun and Bezez layers, even though it would be wrong to make biface morphology a principal basis for such correlation. Similar use might be made of Micoquian biface percentages, since these are scarce at Bezez and occur more often in the lower layers of Tabun E (ibid., p.84).

The Masloukh bifaces have not yet been described, but are regarded by Skinner as 'typical'; they form 4% of the industry (Skinner, 1970; his Fig.6 shows a lanceolate biface and two bifacial racloirs).

Comparison of the mean lengths of bifaces was thought by Gilead (1970) to have substantial chronological significance in the Middle East, and our Fig.C.21 shows that those of Bezez and those of Tabun excavated by Garrod are not similar. Garrod noted a decline in size of Tabun bifaces in mid-sequence (Garrod and Bate, 1937, p.85) and indeed, many Bezez pieces seem more rugged than those of Tabun (at least, those in the collections). In this respect, Bezez is possibly linked rather with an element seen in northern sites; we could cite the presence of robust bifaces at the Rissian (or later) Acheulean sites of Ras Beirut IV (Bergy, 1932), and at Roudo near Lattakiyeh (Sanlaville, 1979), both of which also have the small, neat Tabun F types as well.

Fig.C.22 shows that, although some of the biface/racloir ratios are comparable at the two sites, no value from Tabun E matches that of Bezez D255, the closest being that of Ea.

B. RACLOIRS

An excellent match for the Bezez C racloirs is to be found at Tabun in Garrod's layer Eb. This layer includes, besides the characteristic 'Yabrudian' forms (angular, tranverse, Quina and pointed racloirs), some thinner pieces with flat scalar Mousterian retouch, just as does Bezez C. Also present are unifaces, minute racloirs, Quina racloirs on 'prepared' flakes, Bezez-type

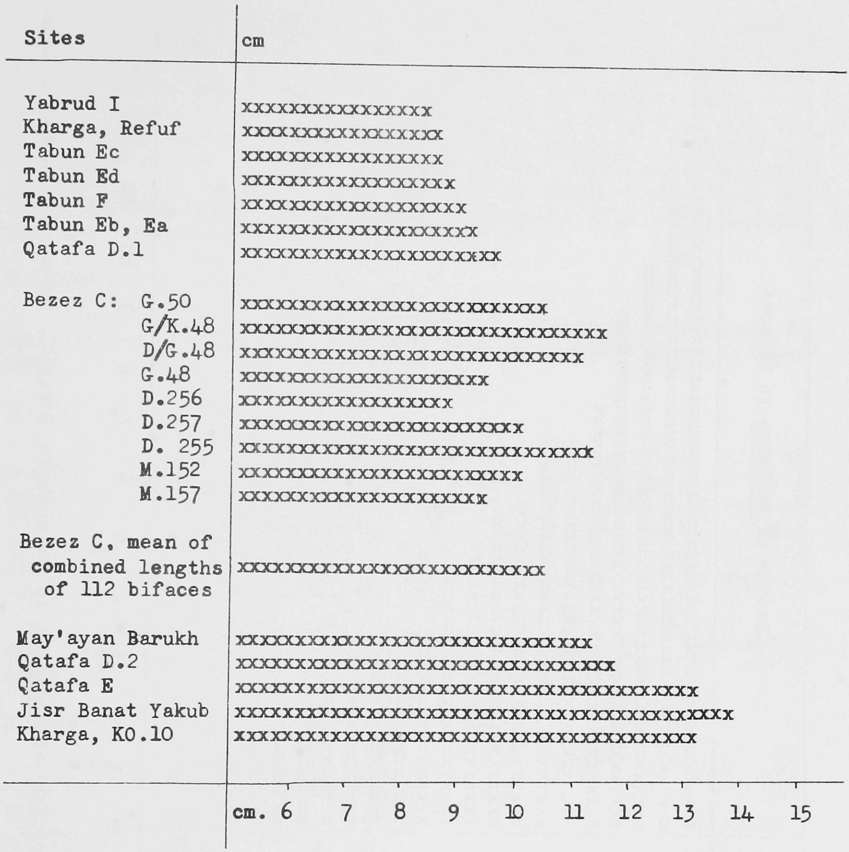



Fig.C.21. Comparison of the mean lengths of biface groups from Levant sites. The figures for all sites except Bezez are after Gilead (1970, p.8, fig.2).

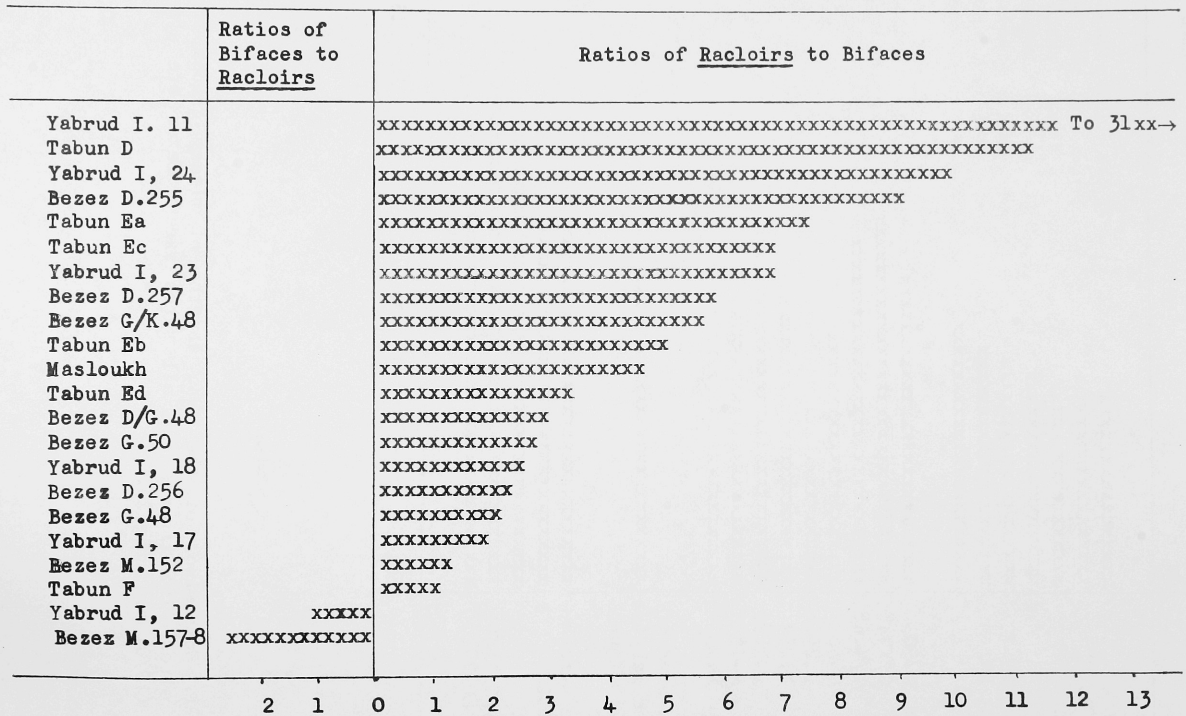



Fig.C.22. Comparison of the ratios of racloirs to bifaces in Bezez C, Tabun and Yabrud I layers, arranged in descending order.

convergent racloirs (made, however, on flakes), numbers of burned and broken racloirs, as well as massive pieces made on Nummulitic slabs which are interchangeable with specimens from Bezez C.

The Masloukh racloirs have been classified mainly into offset, single convex and single straight types; this is in contrast to the greater diversity seen in Bezez C. Transverse and convergent forms seem to be scarcer at Masloukh, while there are greater numbers of offset forms (15% real) as against only 5% in Bezez C). With its lower biface index and more numerous offset racloirs, Masloukh may be closer either to Tabun Bed 156, to the approximate Yabrud I facies (as the excavator concluded) or to Bezez layers D255 and D257. Alternatively, the classifiers' personal bias could account for the differences.

C. CHOPPING-TOOLS

The neat, well-made forms of Tabun F, Ed and Ec seem rarely to be present in Bezez C. The pieces from Eb resemble Bezez C types more closely.

D. LEVALLOIS FORMS

Unit XI at Tabun (near the top of E) contained 3 - 5% Levallois pieces. This is a lower IL than that of most of the G layers in Bezez C (Table C.8), but it correlates well with that of G50 (3.4%) and of the D layers (c. 5%). Some of the blades included in the ILam for Bed 48A (now redesignated to 75S in Unit XI) are comparable to the Levallois types of Abri Zumoffen in the Amudian layers; a few also occur in Bezez C.

At Masloukh, comparably low Levallois indices are reported, the IL being 2.0% and the ILTy being 0.8% (Skinner, 1970, pp.153 and 157).

E. HEAVY-DUTY PIECES

Massive scrapers, quadrihedral picks and rabots are not mentioned in the reports from Tabun and Masloukh, although Neuville reports some pieces from Qatafa which are similar to the heavy element in Bezez C. At Ras Beirut, Bergy (1932) has described comparable pieces; they are associated with early Levallois forms and are presumed to date to Riss or early Enfean times. A need for heavy equipment was apparently felt more at Ras Beirut and Bezez than at Tabun or Masloukh.

In summing up, it seem clear that the amalgamated Bezez C material compares most closely with that from the upper part of Garrod's layer E at Tabun, but that the two series are not identical. Proportionally, it appears to resemble the Masloukh assemblages less closely

BEZEZ C COMPARED TO INLAND ASSEMBLAGES: YABRUD I, levels 25 - 11

The lower levels at this rockshelter in inland Syria have relevant material, even if it is located in an environment quite different from that of Bezez. It lies on the outskirts of Yabrud, a summer-resort village, 1,418m. above sea-level; from the point of

view of prehistory, this is situated at the junction of two ecological zones, mountain and steppe. Rust, the first excavator, distinguished several thin layers (many of which had small tool totals) to which he applied individual names (1950), reserving the term 'Jabrudian' for four layers without bifaces (levels 25, 22, 16 and 14).

The Yabrudian industry is best seen in Rust's level 22, and consists of flakes of non-Levallois _débitage_. It is characterised by offset _racloirs_, particularly by an acute-angled form, the _Winkelkratzer_. Its nearest analogue in Europe would be the Charentian or Quina Mousterian, from which the Yabrudian differs slightly, e.g. by having more offset than transverse _racloirs_ (Bordes, 1953).

According to Rust, interspersed with the Yabrudian layers were others (containing bifaces), which he called Acheulean. In re-studying Rust's material, Bordes (1955 and 1958) noticed that these layers lacked offset _racloirs_ and had fair Levallois indices. Yet other levels interdigitated with Rust's Yabrudian and Acheulean layers; apart from the pre-Aurignacian in layers 15 and 13; some of these had a few bifaces and they were termed Acheuleo-Yabrudian; two levels (24 and 11) had good samples, as discussed above. So far as the alternation of these industries is concerned, recent investigations at Yabrud raise questions as to the order in which the layers (often widely separated from each other laterally) were actually laid down (Solecki, 1970a, b; Copeland, 1975).

In comparing the Yabrud I layers, as published, to those of Bezez C by means of their cumulative graphs, we see that levels 24 and 11 relate to Trench D layers in having a Yabrudian-like curve for an industry in which, nevertheless, there were a number of bifaces (Fig.C.19a, b, c)). However, the typical Yabrudian level, 22, contrasts with the Bezez facies in having no bifaces and a higher number of offset _racloirs_. As to the Acheulean levels, although certain of them loosely resemble M152, none is a really close match.

In sum, the components of the facies at Yabrud I seem to combine somewhat differently from the way they do in Bezez and Tabun. This should not be surprising, considering the different environments involved. Moreover, as recent work in the Orontes valley and El-Koum indicates, Levallois forms of _débitage_ and bifaces occur in association, interpreted as local Final Acheulean or early Middle Palaeolithic facies by Besançon _et al._ (1978; 1981), and it is to the cultures of these northern and eastern regions that the Acheulean levels at Yabrud I may be linked.

Be that as it may, the foregoing review of the sites most relevant to Bezez C has at least had a general bearing on the regional context of the industry. Closer comparisons must await full reports on the material excavated during the last two decades. It would be particularly interesting to have data on possible lateral distributions at these sites, as well as details of the general vertical alternation of facies, seen in one particular form at Tabun.

We have not discussed several other known Acheuleo-Yabrudian sites, such as Zuttiyeh Cave, or the open sites such as Lion Spring and C Spring at Azraq (Zeuner _et al._, 1957; Rollefson, 1980), Ain Musa near Mount Carmel (Duvignau, 1930), or Hummal Ib (Besançon _et al._, 1981), since only general comparisons can yet be made. However, offset and transverse _racloirs_ always form the characteristic types of tool at these sites, even though bifaces occur in differing proportions.

There remains the problem of the different chronologies used at Tabun and Bezez C. The chronology proposed by Farrand would make Bezez C date to the Tabun Ed-Ec phase at the latest, which does not tally with the typological indications discussed above. However, if we are to accept the chronology of Sanlaville for Bezez C, it must indeed be older than the Ea-Eb phase, typology notwithstanding. Perhaps the solution lies in the eventual 'fit' of Bezez C with some specific sub-unit within one of the Tabun beds, rather than with Tabun E/Units XIII - X as a whole.

Our final conclusions regarding Bezez C are presented in Chapter 8.

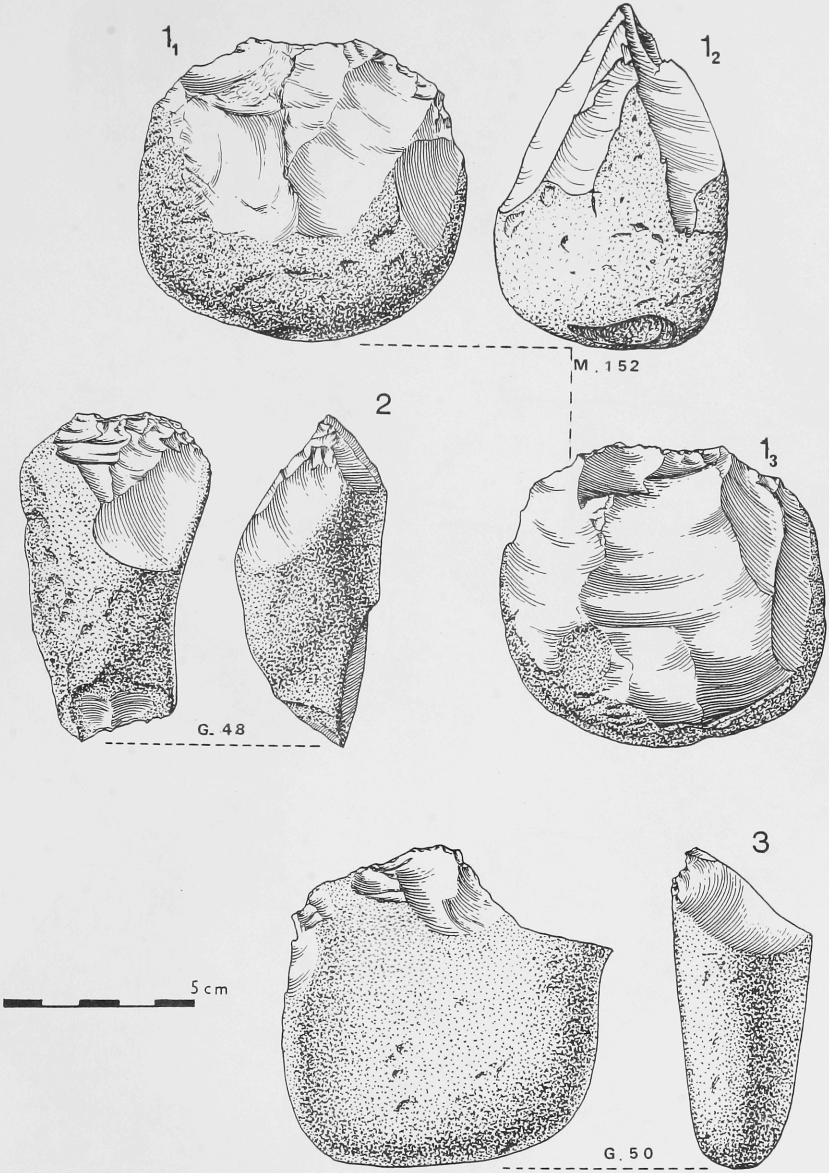



Plate C.1. All from Level C. 1) Three views of a chopping-tool on a globular pebble; note the squat biconvex side profile, drawn slightly tilted to show the chopping-edge, which is straight in plan, sinuous in profile. 7.6 x 8.5 x 8.4cm. 2) Pebble chopping-tool on a cylindrical nodule of piebald flint; dihedral blows each end give two chisel-like edges. 8.8 x 4.8 x 3.9cm. 3) Chopping-tool passing to chopper on a flattened pebble of fine-grain Nummulitic flint; the chopping edge is sinuous in profile. 8.7 x 8.4 x 3.4cm.

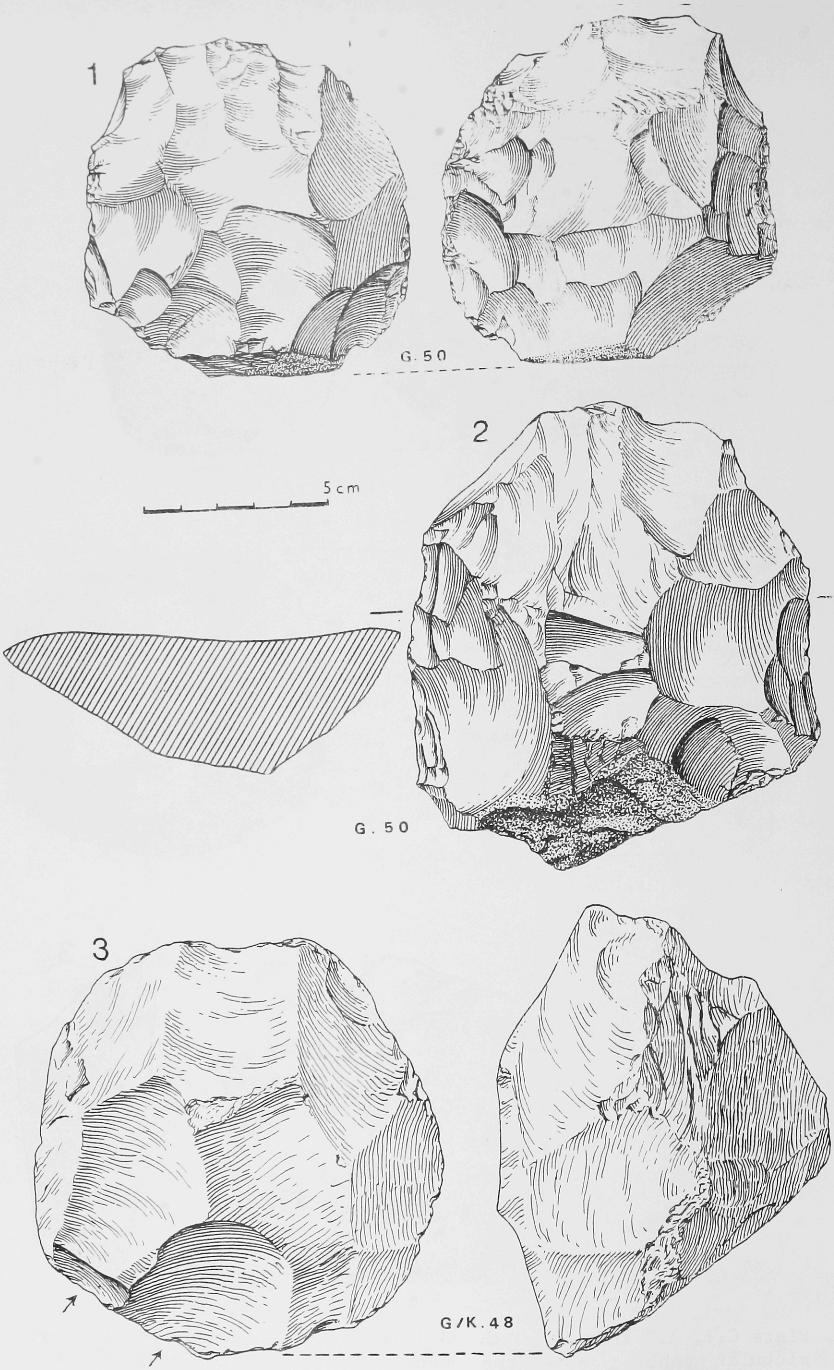



Plate C.2. All from Level C. 1) Chopping-tool made on a (discoid?) core, retouched all over except at base; biconvex side-profile. Chopping-edge is sinuous, and placed on the distal and left lateral sides. 9.5 x 8.6 x 4.6cm. 2) Chopper on a massive flake struck from an older piece (two patinas), probably a proto-Levallois or discoid core; retouch is fairly abrupt both sides of base. Chopping-edge is battered, and has small area of bifacial retouch. 11.8 x 8.4 x 3.4cm. 3) Unstruck Levallois core (re-used as a chopping-tool? note new facets (arrowed) on base of left view); base is conical, with patch of cortex on apex of cone. Sinuous peripheral ridge, abraded one side (right-hand view). Upper surface centripetally prepared, obscured by heavy patina. 12.0 x 10.8 x 8.4cm.

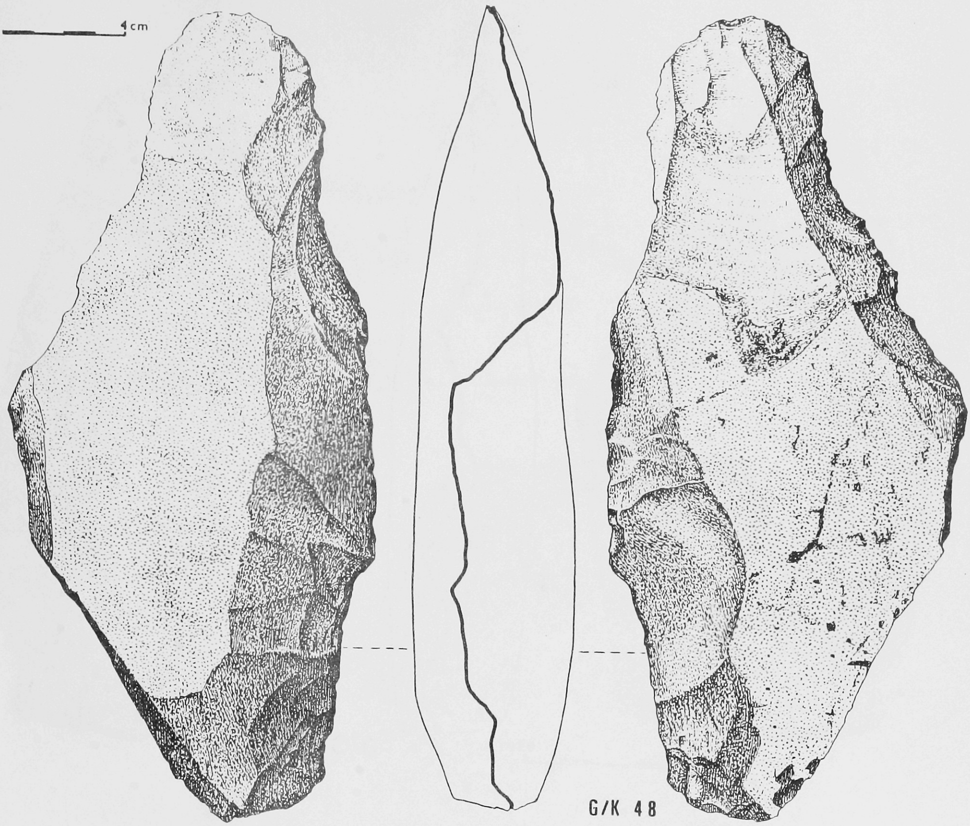



Plate C.3. Level C. Massive backed biface or biface rough-out of Nummulitic tabular flint. 'Back' is on left side in left-hand view, formed of abrupt retouch distally and a cleavage surface proximally, while edge is roughly bifacial, with secondary working only at the tip on both sides; sinuous profile, unmodified base, thin biconvex tip. 27.2 x 13.0 x 5.8cm.

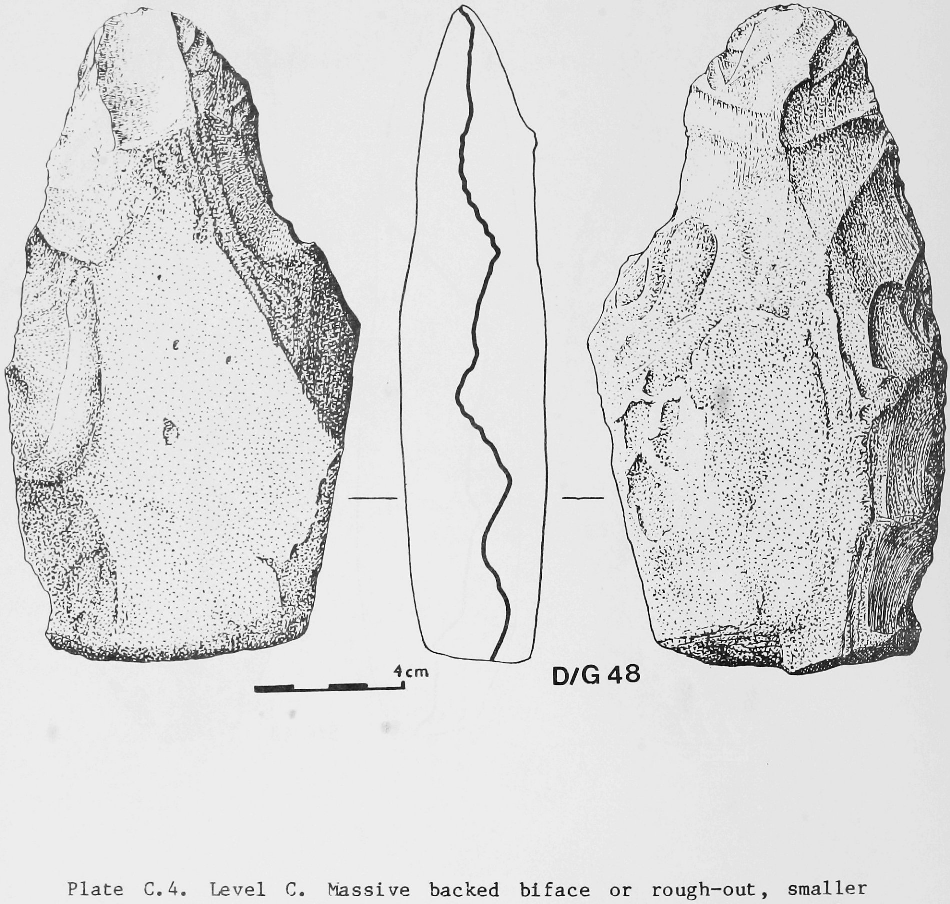



Plate C.4. Level C. Massive backed biface or rough-out, smaller version of piece shown in previous plate, also on tabular Nummulitic flint or silicious limestone. 'Back' is on right side of left-hand view, a cleavage surface proximally, with abrupt retouch distally. The edge is formed of large, alternate primary faceting with little secondary working. Tip is duck-billed and rather thick, base is unmodified. 17.0 x 9.7 x 3.8cm.

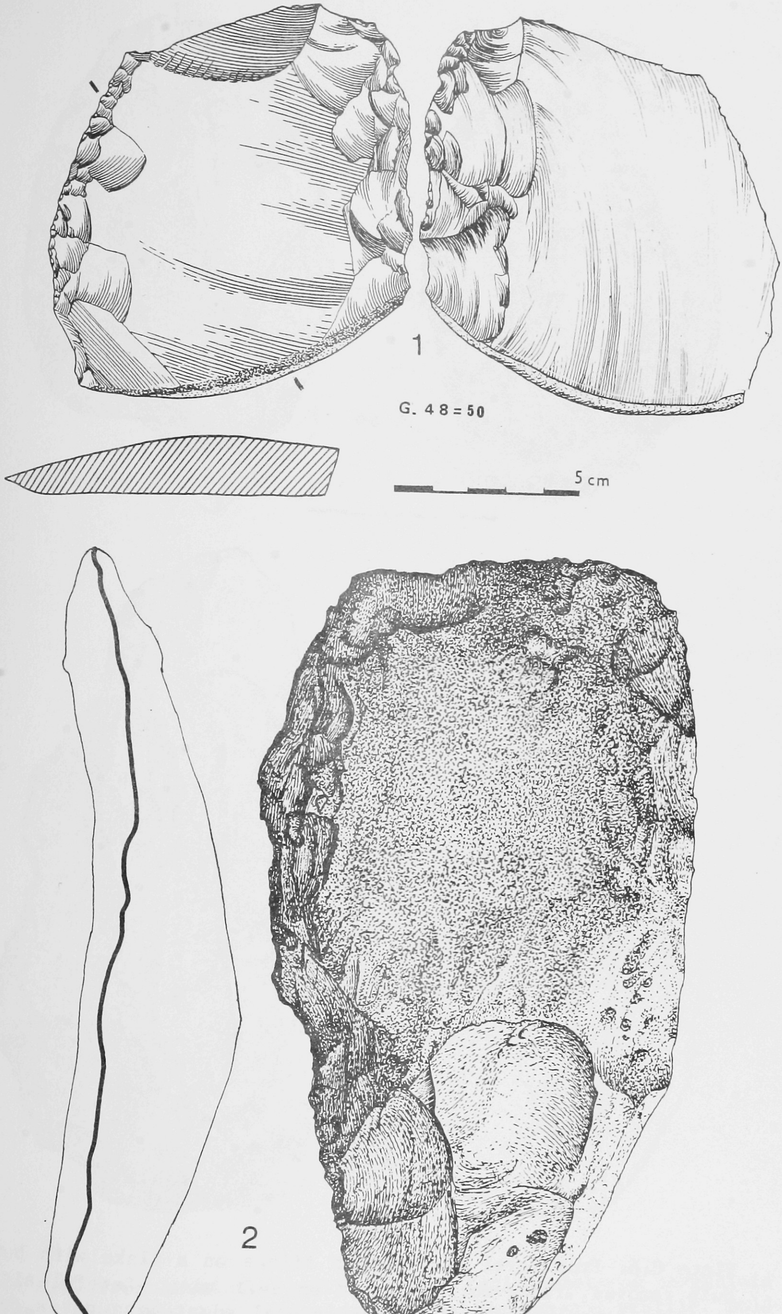



Plate C.5. From Level C. 1) Atypical cleaver, or alternatively an atypical racloir with thinned back. 12.3 x 9.3 x 3.1cm. 2) Cleaver made on an end-struck cortex-flake, measuring 20.5 x 11.6 x 4.3cm., with partially-thinned bulb and a pronounced curve in profile. Both edges are directly retouched (semi-abrupt) and the distal edge is partly cortex and partly roughly retouched. An alternative

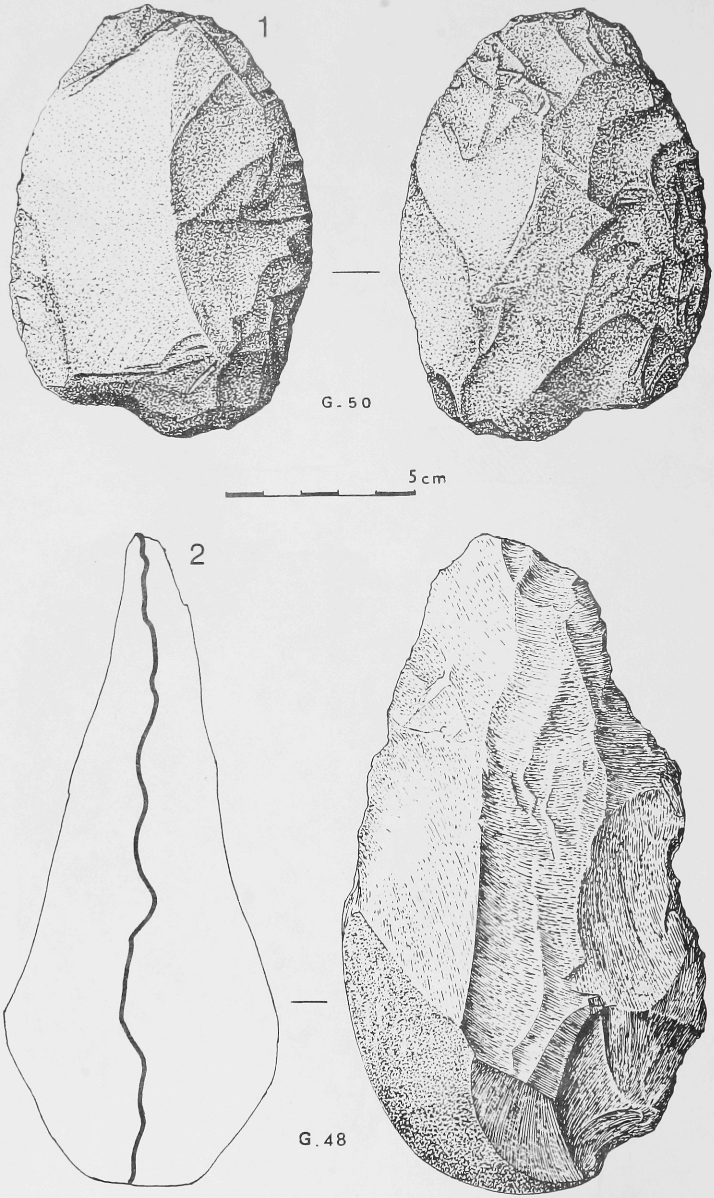



Plate C.6. From Level C. 1) Ovate biface on a flake with butt and bulb removed, flake-surface shown on left view. Careful alternate retouch ('revolving retouch') on lateral edge. Base not a cutting-edge. Tip rounded and thin. One straight, one sinuous edge with S-twist. 11.5 x 8.4 x 3.3cm. 2) Lanceolate biface (atypical in that right edge is not straight (re-worked) and other edge is proximally backed by cortex), made on a Nummulitic flint cobble. Bold, primary retouch; a little secondary working at tip. 18.0 x 9.1 x 7.0cm.

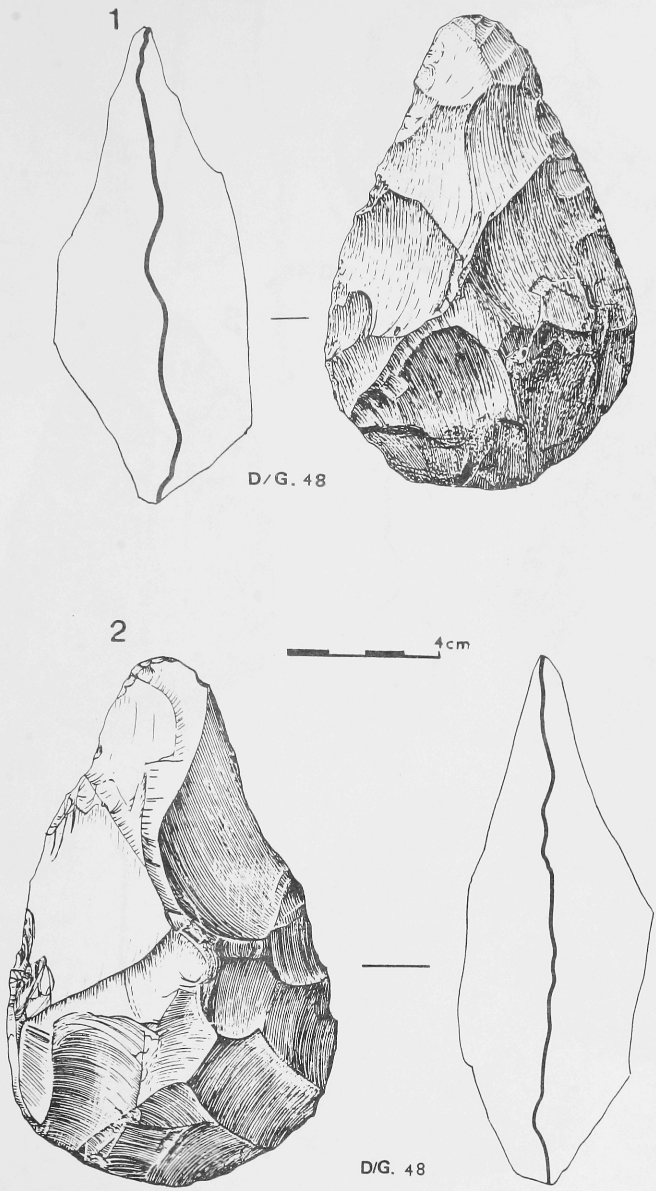



Plate C.7. From Level C. 1) Biface on borderline between amygdaloid and pyriform. *Méplat* at base, asymmetric section and profile. Bold all-over flaking; tip a rounded point. 12.8 x 8.8 x 7.6cm. 2) Amygdaloid biface with perfect semi-circular base. One straight, one sinuous edge, thin sharp tip; finer retouch ('*racloir* retouch') on face not shown. 14.4 x 8.8 x 4.8cm.

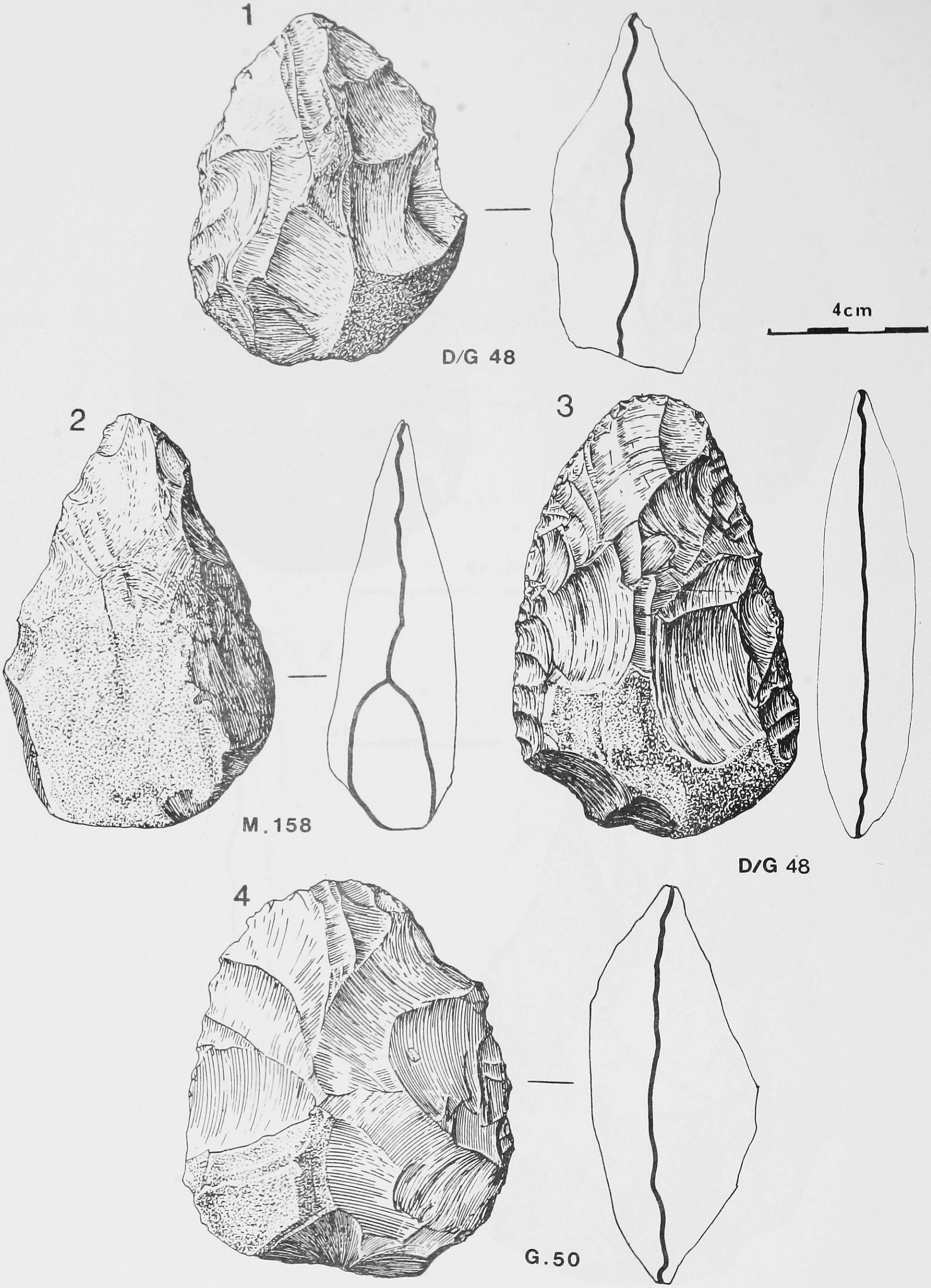



Plate C.8. All from Level C. 1) Pyriform biface on pebble of desilicified buff flint; base is half cortex, half cleavage surface. Coarse flaking both sides; straight edges; tip is rounded point. 9.4 x 7.2 x 4.5cm. 2) Lanceolate biface with two *méplats* (on side and base), one straight and one sinuous edge, pointed tip and biconvex section. Shiny surface (heat treated?). Some re-working on one edge. 11.1 x 7.0 x 3.5cm. 3) Elongated cordiform biface on a very flat and thin pebble, cortex on both faces and one side of base. Very straight edges, rounded tip, *tranchet* on face not shown, *couvrante* retouch except at base. 11.7 x 7.8 x 2.5cm. 4) Discoid biface, on a plump biconvex flint nodule, slightly abraded edges, reddish concretion both sides. One straight, one sinuous edge, broad rounded tip and centripetal flat flaking both sides, with resolved flaking at tip on side not shown. 10.0 x 8.2 x 8.2cm.

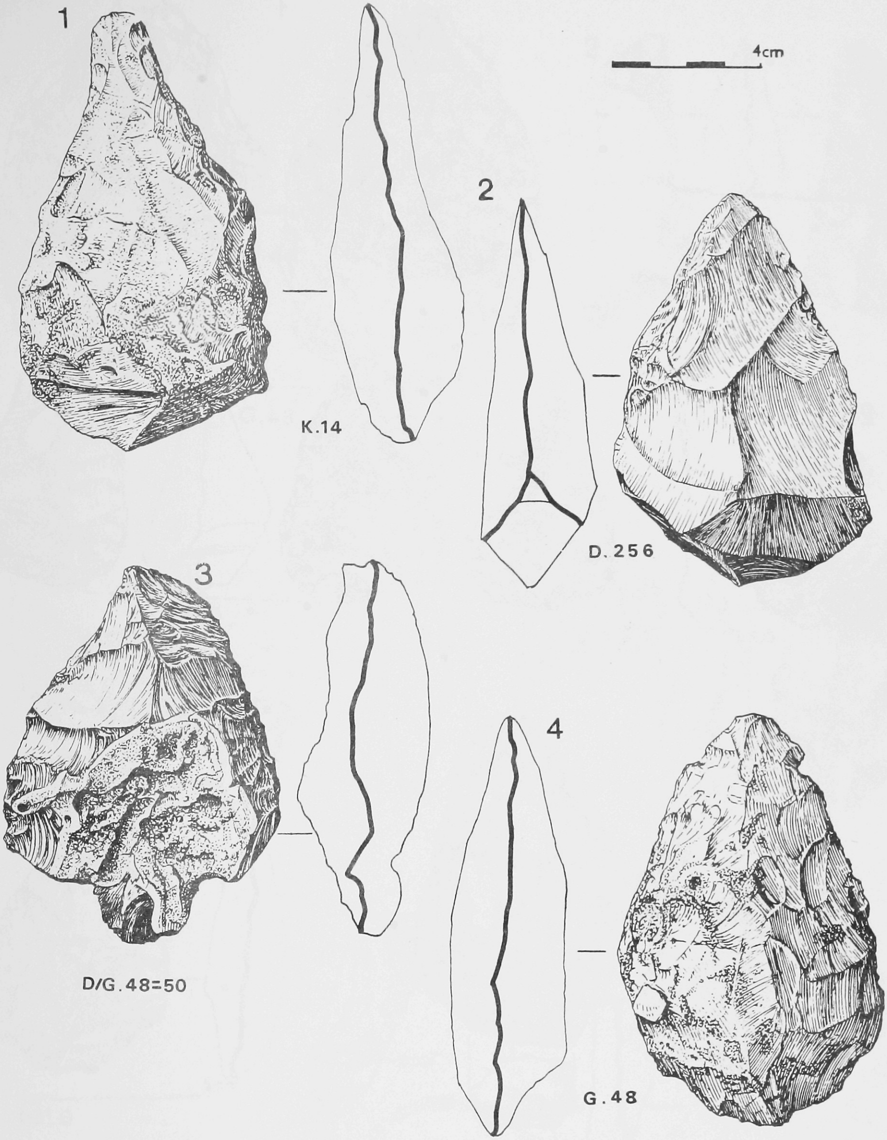



Plate C.9. All from Level C. 1) 'Micoquian' biface on a flake of buff flint. Biconvex section; tip is acuminate and quadrihedral in section. Straight/sinuous edges, rather rough flaking both faces, resolved and Quina-like on one face. 12.0 x 6.9 x 3.2cm. 2) Subtriangular biface, perhaps upper part of a now-broken lanceolate type; cleavage surfaces at base and one side; pointed tip, flat biconvex section, no cortex. Retouch is neat, sparse and flat with fine working at the edge of one side. 10.7 x 7.0 x 3.1cm. 3) *Divers* biface. The tip is re-worked into a (possible) burin, and the butt has a false tang formed of cortex and *géodes*. Irregular retouch all over one face; sinuous edges, concavo-convex profile. 10.0+ x 7.5 x 2.3cm. 4) Ovate biface (pointed ovate) of buff tabular flint covered with brownish-red concretions. Tip slightly broken, flat biconvex section, base thinned asymmetrically from above. Neat retouch, flat scalar except at edge, where it is stepped scalar. 11.1 x 7.0 x 6.8cm.

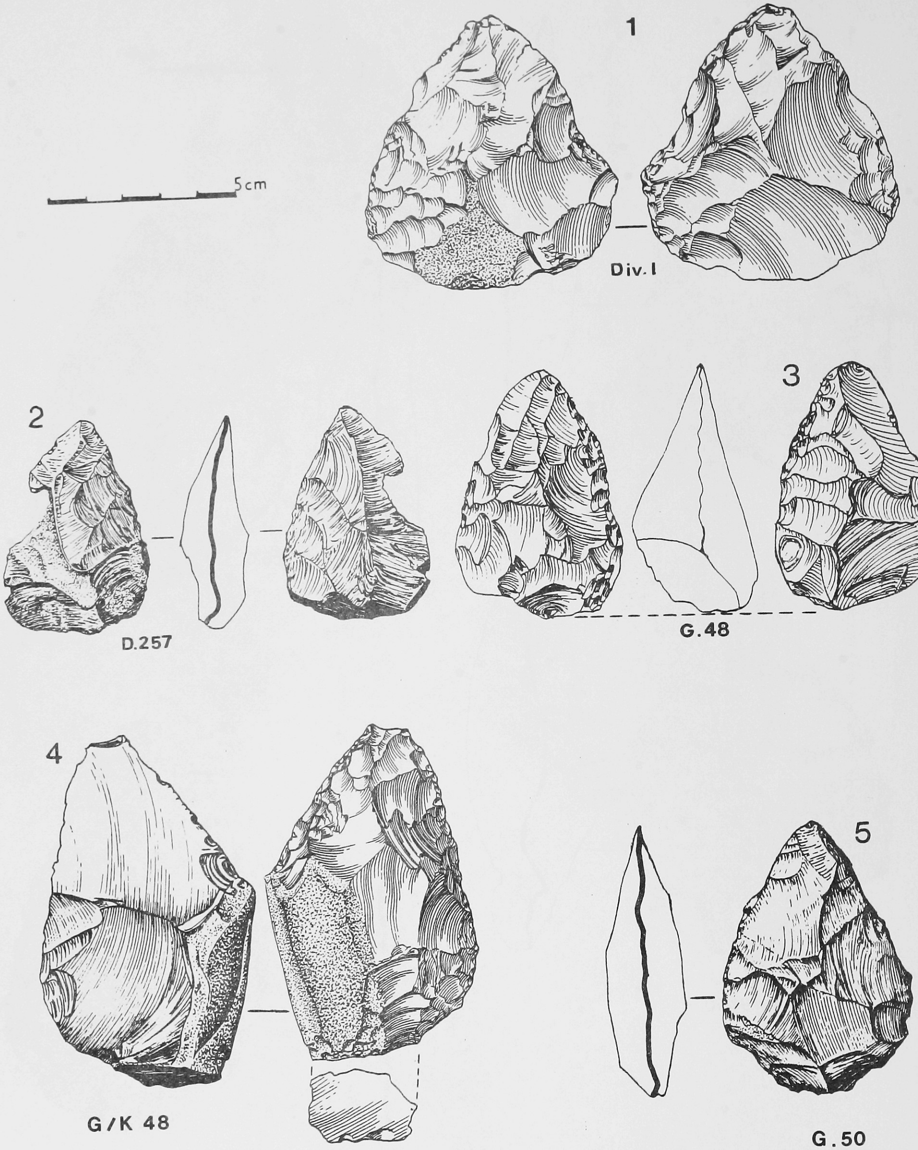



Plate C.10. All from Level C. 1) Pyriform biface passing to subtriangular, on thickly-patinated nodule. Base is a cutting-edge, tip rounded, edges sinuous; profile is biconvex. 7.1 x 6.9 x 2.9cm. (Piece found in Neolithic pit in-filling.) 2) Minute cordiform biface (5.8 x 3.9+ x 1.7cm.) on a decayed nodule with *géode* which has spoiled one edge. Flat scalar retouch all over, one face almost being made by one facet, seen on right view. Concavo-convex profile, straight edges, one with S-twist; no cutting-edge on base. 3) Pyriform biface (L/m = 1.52), made possibly on a flake, thin tip and very thick base (partly butt of flake?); straight edges, one with S-twist. Neat flat flaking all over, a downward blow from tip on one face. 6.3 x 4.2 x 2.6cm. 4) Partial biface, tending towards a bifacial *racloir*, made on a potato-shaped nodule. The retouch on one face is *racloir*-like while the reverse face was made by two large removals. Tip broken, flat 'stand-up' base, biconvex profile; straight edges with S-twist, one consisting partly of cortex. 8.9 x 5.7 x 3.3cm. 5) Small cordiform biface on a buff flint nodule, with continuous edge all round. Base is sinuous but rest of retouch is neat and flat on both sides, edges sinuous/straight, tip thin and sharp; in 'mint condition'. 7.3 x 5.4 x 2.2cm.

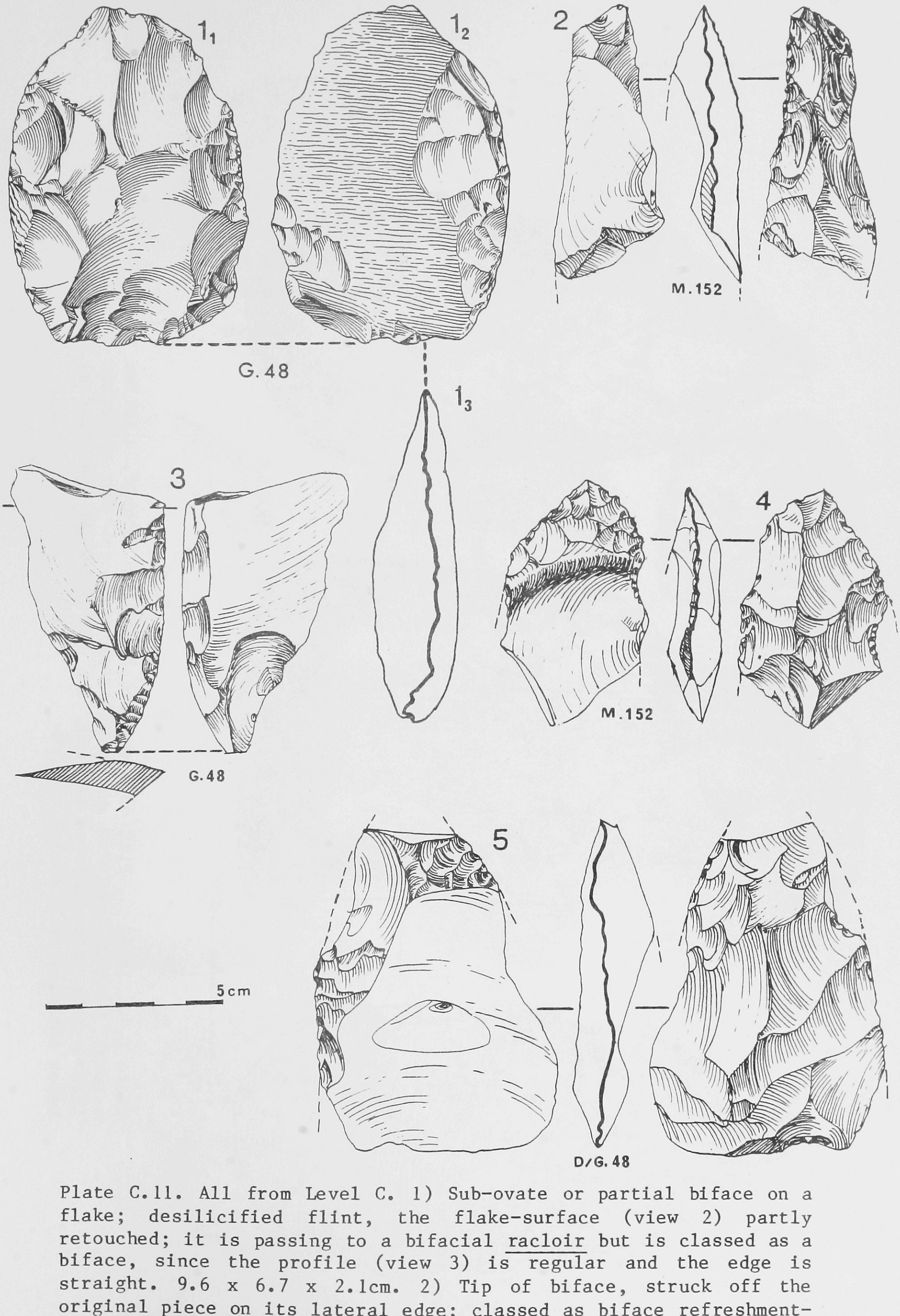



Plate C.11. All from Level C. 1) Sub-ovate or partial biface on a flake; desilicified flint, the flake-surface (view 2) partly retouched; it is passing to a bifacial <u>racloir</u> but is classed as a biface, since the profile (view 3) is regular and the edge is straight. 9.6 x 6.7 x 2.1cm. 2) Tip of biface, struck off the original piece on its lateral edge; classed as biface refreshment-flake. 3, 4) Fragments of the lateral edges of bifaces. 5) Fragment of a biface consisting of one face, removed from near the tip.

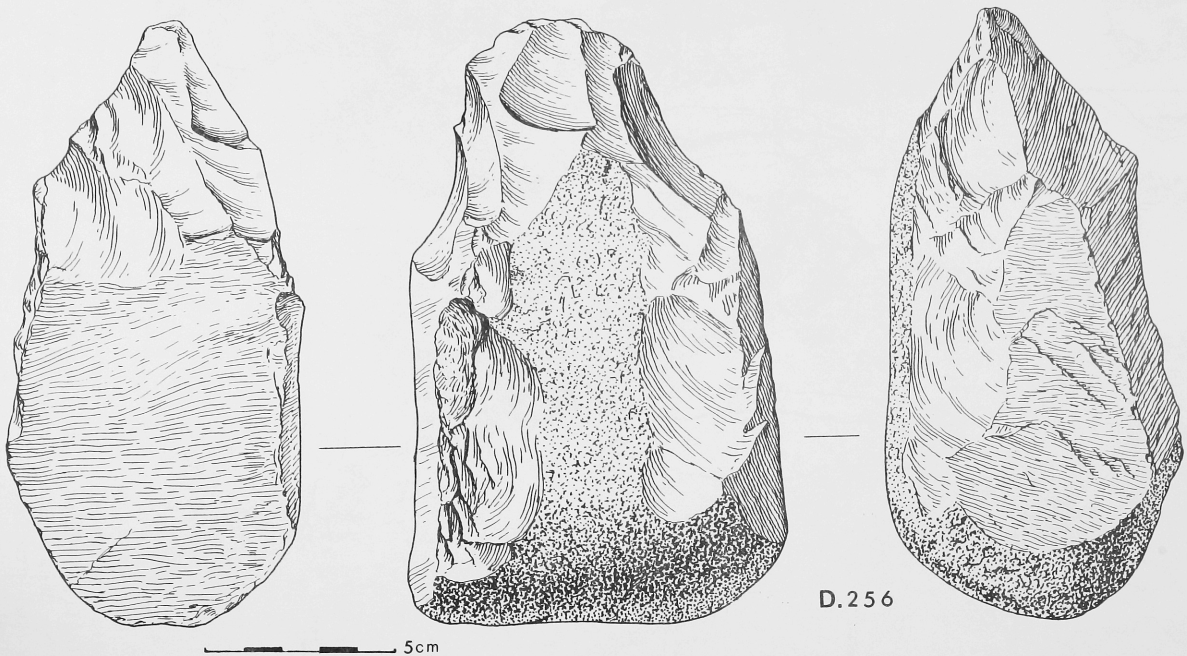



Plate C.12. Level C. Pick on a massive Nummulitic cobble, with two natural cleavage surfaces and two cortex surfaces. Tip retouched into a nose with biconvex section, but the piece is quadrihedral below the tip. 16.1 x 10.0 x 7.9cm.

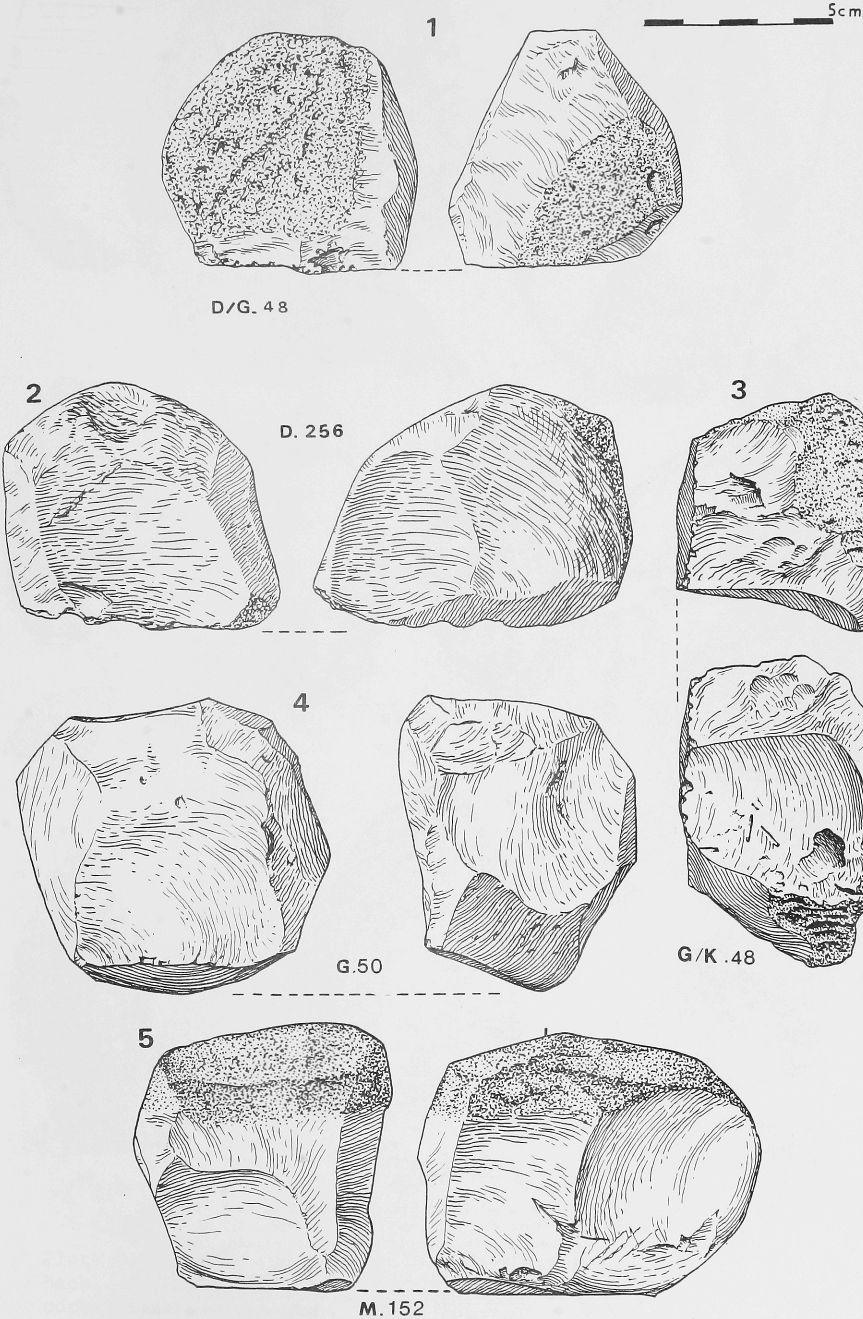



Plate C.13. All from Level C. 1-5) Five polyhedrons, or naturally-faceted balls, discussed in the text, p.120.

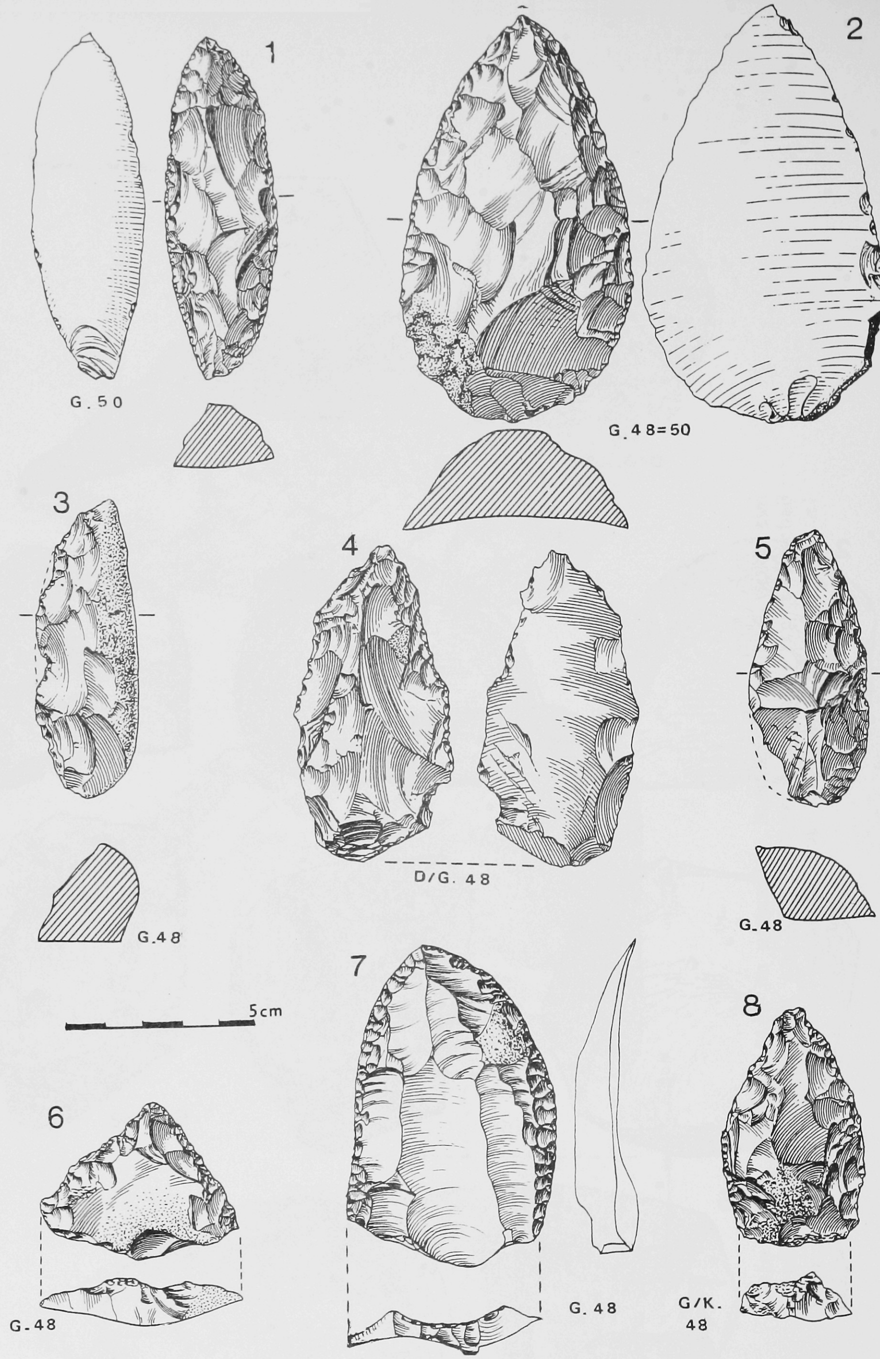



Plate C.14. All from Level C. 1) Limace, pointed at both ends; all over steep Quina retouch. Butt and bulb removed. 8.9 x 2.8 x 1.8cm. 2) Convergent biconvex racloir with Quina retouch, 'uniface' type, with scraping-edge almost all round. Made on an oblique-bulb flake; butt slightly thinned, sharp thin tip; profile is curved. 3) Atypical limace or 'demi-limace'; described in the text, p.122; 7.0 x 2.7 x 2.2cm. 4) Convergent biconvex racloir with very rough retouch, broken at tip, with two patinas; somewhat resembles a pointe de Tayac. 5) Atypical limace or 'backed' convex racloir, on thick blade with triangular section and vertical cortex back from butt to tip. Quina retouch on one side. 7.2 x 3.1 x 1.8cm. 6) Small convergent racloir; straight or straight/convex on a cortex flake. 7) Mousterian point on a Levallois flake, passing to a retouched Levallois point. The point seems to be too fine and sharp for the piece to be a racloir. 8.6 x 4.8 x 0.9cm. 8) Convergent biconvex racloir, fine thin retouch one side. Thin at tip and thick over butt.

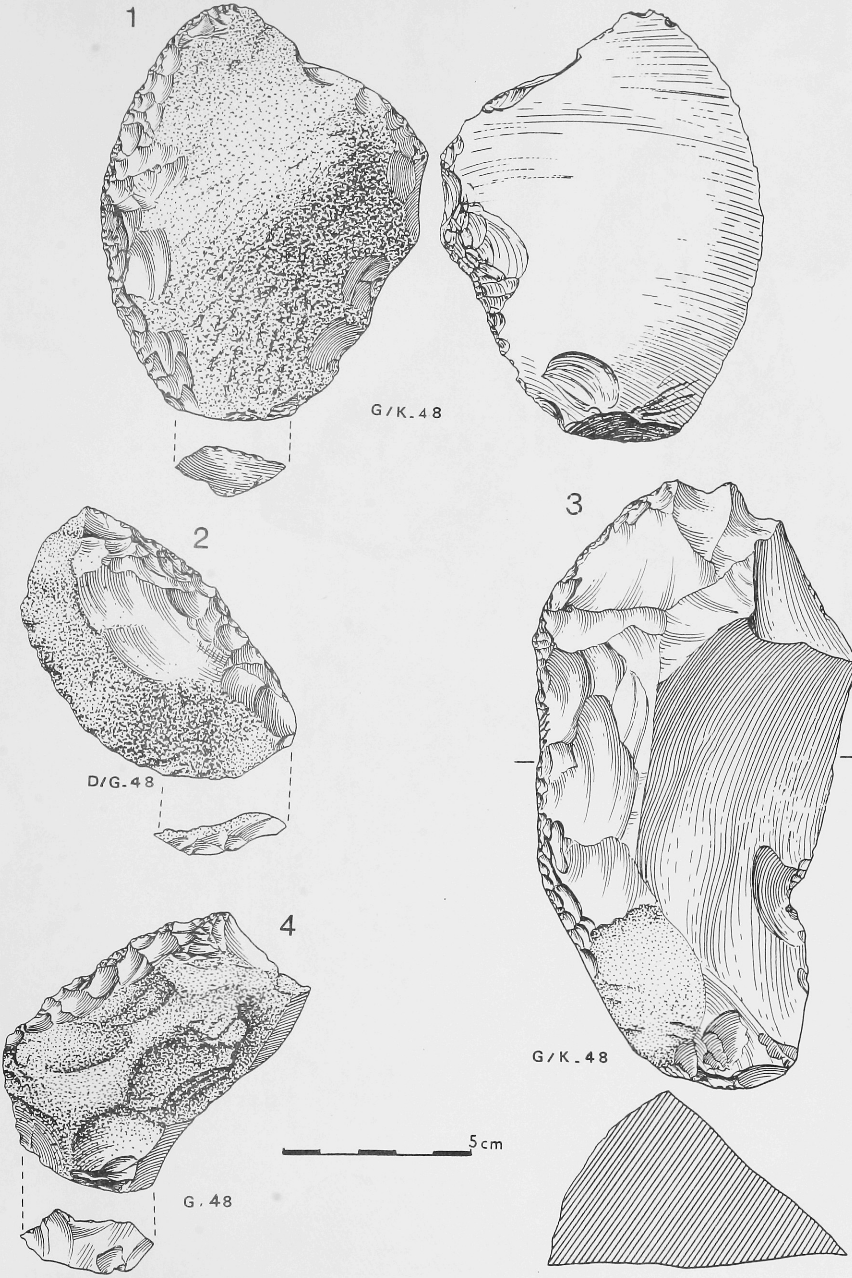



Plate C.15. All from Level C. 1) Single convex racloir with thinned back, on a cortex flake. 2) Small single convex racloir, on a cortex-flake with demi-Quina retouch. 3) Massive single convex racloir, with Quina retouch and Clactonian notches at tip and side. Asymmetrical section, top-heavy distally. 4) Single convex racloir with slightly denticulated edge and natural cleavage surfaces at tip and sides.

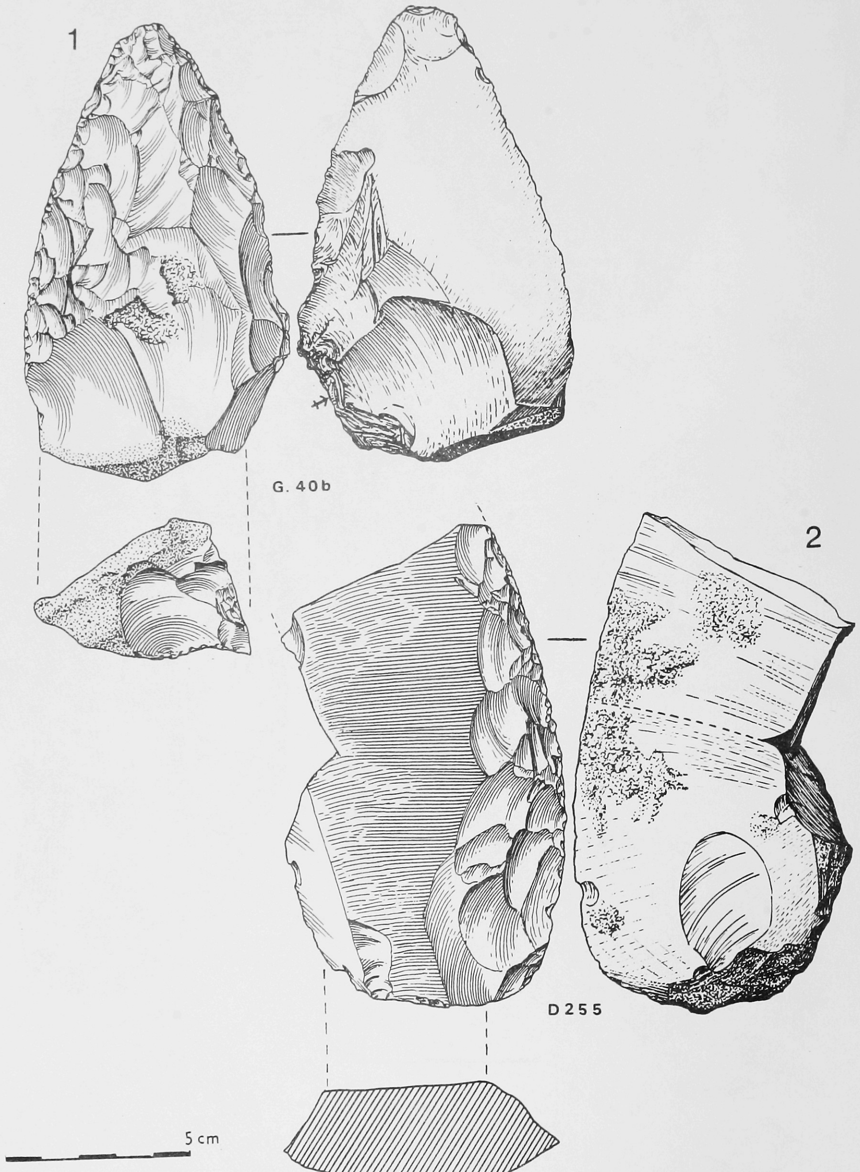



Plate C.16. Level C and G40b. 1) G40b, convergent biconvex racloir with Quina retouch, passing to a partial biface, on an oblique-bulb flake thinned at butt; bulb removed. 2) Level C, broken single convex racloir with Quina retouch, on a large end-bulb flake.

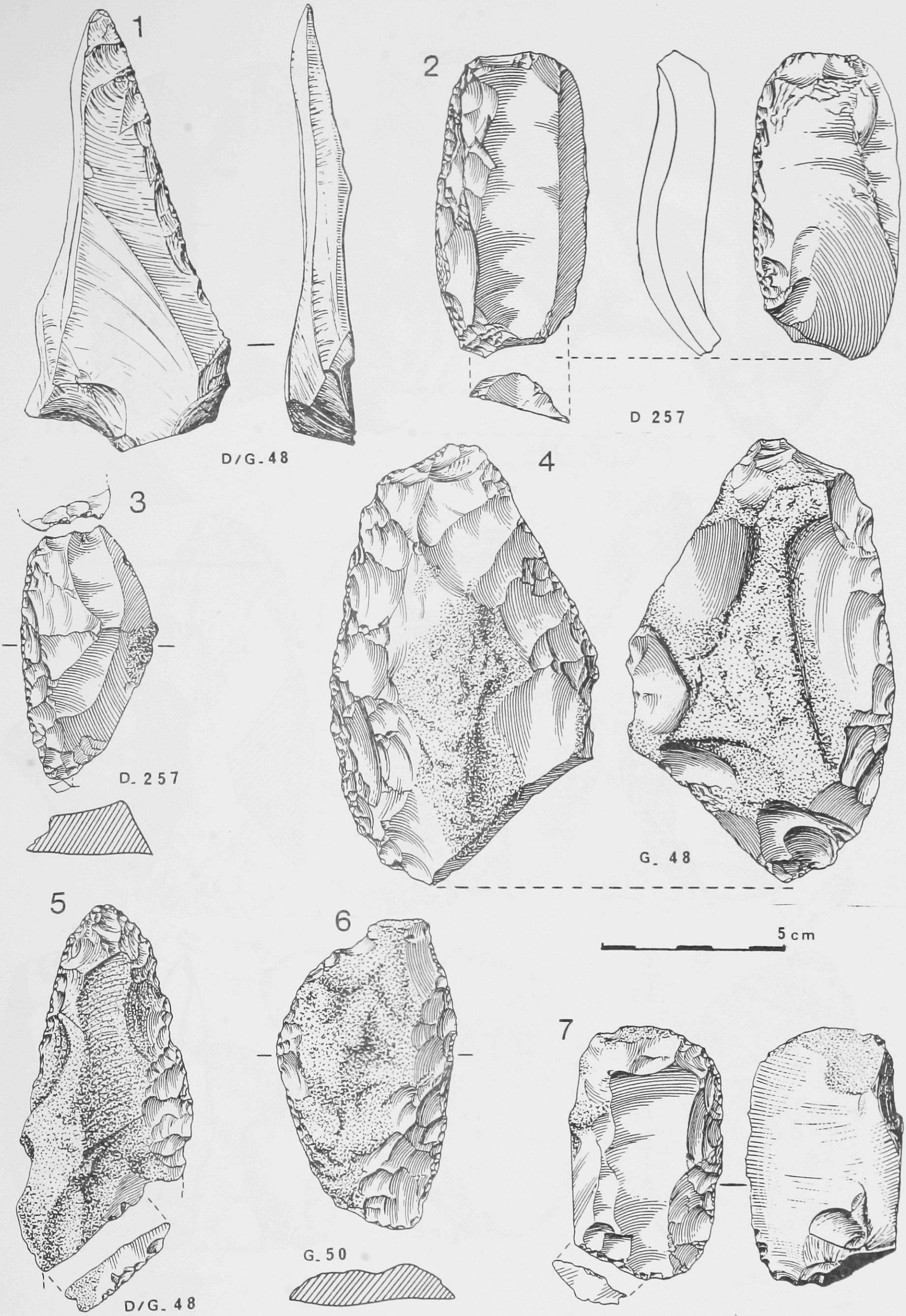



Plate C.17. All from Level C. 1) Single convex racloir on a split ('burin de Siret') flake. 2) Double racloir, with alternate retouch on a flake with curved profile and inverse retouch at tip. 3) Single convex racloir with traces of core-preparation at tip. 4) Racloir with bifacial retouch, on a thin slab of tabular flint; it has cortex on both faces; retouch is very rough on the under side, and racloir edge is bifacial. 5) Convergent biconvex racloir, Bezez-type, on a cortex flake; described in the text; see Table C.6. 6) Double convex racloir on a cortex flake. 7) Single convex racloir, tending towards a single straight racloir with core-preparation back: butt slightly thinned.

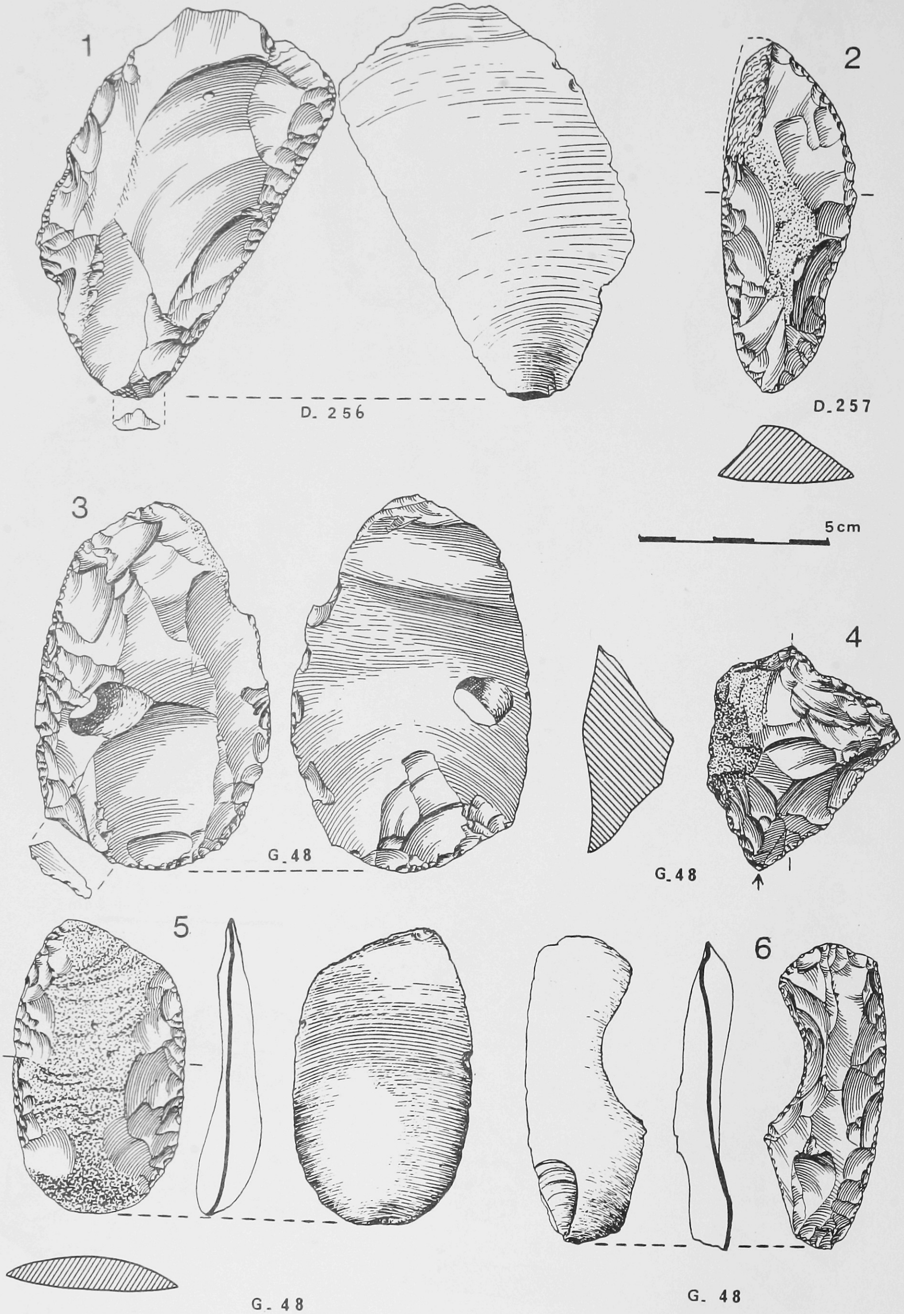



Plate C.18. All from Level C. 1) Double racloir with straight and convex edges, on a non-Levallois flake. 2) Limace, pointed one end, burned at the other end. 3) Single convex racloir on a white-patinated, desilicified flake with butt thinned and squamous retouch at the tip. 4) Triple racloir on a polygonal cortex-flake with demi-Quina retouch. 5) Double biconvex racloir on a curved cortex-flake with small linear butt. 6) Double concavo-convex racloir, tending toward a convergent racloir on a blade with Quina retouch and butt removed.

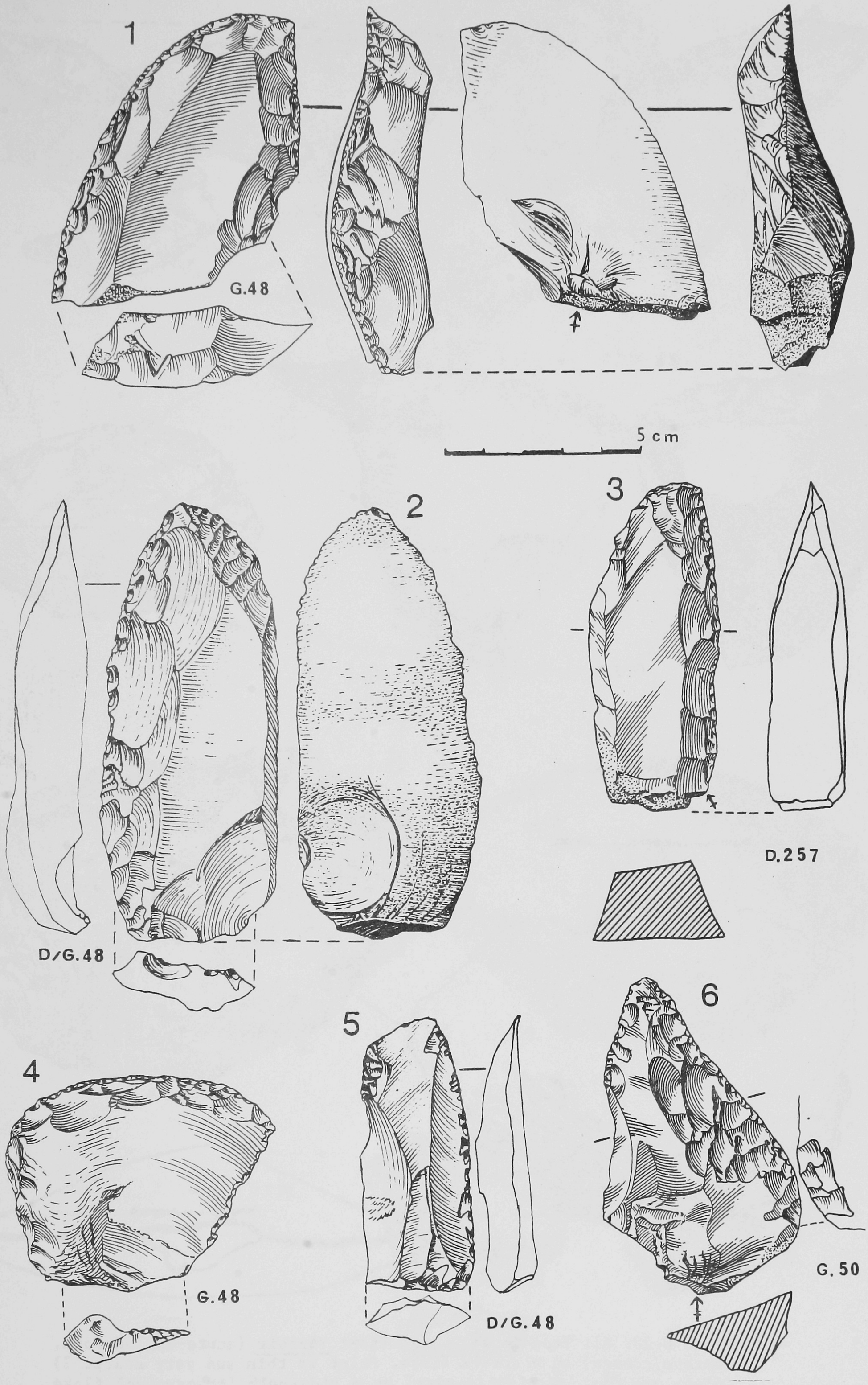



Plate C.19. All from Level C. Four views of an offset (convex/ straight) racloir, at the limit of the offsets and tending towards a convergent racloir. Finely made edges, sharp tip, curved ('rocking-chair') profile. Compare with Fig.C.18a, no.3. 2), 3) Two convergent racloirs, Bezez-type; see Table C.6. 4) Racloir with inverse retouch; transverse convex edge and signs of use retouch on adjacent lateral edge. 5) Retouched blade, passing to atypical backed knife. Small area of retouch near tip on left edge, utilisation traces on right edge. 6) Offset racloir on the inverse surface of an oblique-bulb flake, passing to the acute-angled form.

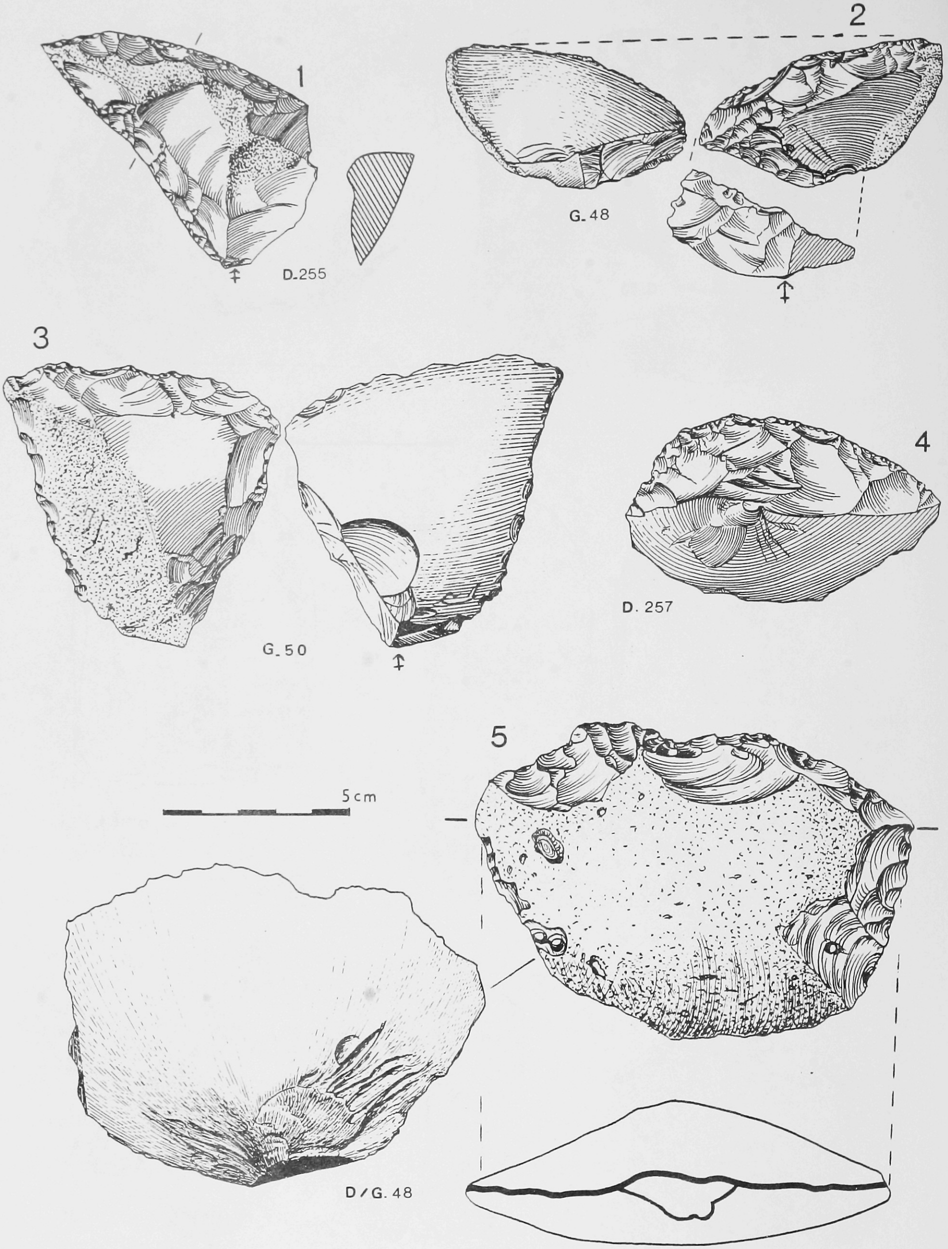



Plate C.20. All from Level C. 1) Offset racloir (acute-angled form, concavo/convex) on a cortex flake. Point is thin and very sharp. 2) Offset racloir (straight/convex) on a side-bulb (transverse) flake with thick, unthinned butt. Converging angle is less acute than on no.1. 3) Offset racloir on an end-bulb flake, passing to a triple racloir (but right-hand edge is abrupt and not secondarily retouched). Half of bulb is removed by indirect retouch. 4) Racloir with inverse retouch, transverse convex edge, passing to divers - the racloir retouch is done on what seems to be the butt of the flake, and is opposed to a cortex area on the upper surface (not shown). 5) Transverse convex racloir, passing to offset (second edge on right) or to a massive scraper (rough retouch on a large flake). The blank is a typical Nummulitic flint cortex flake struck off by stone hammer technique.

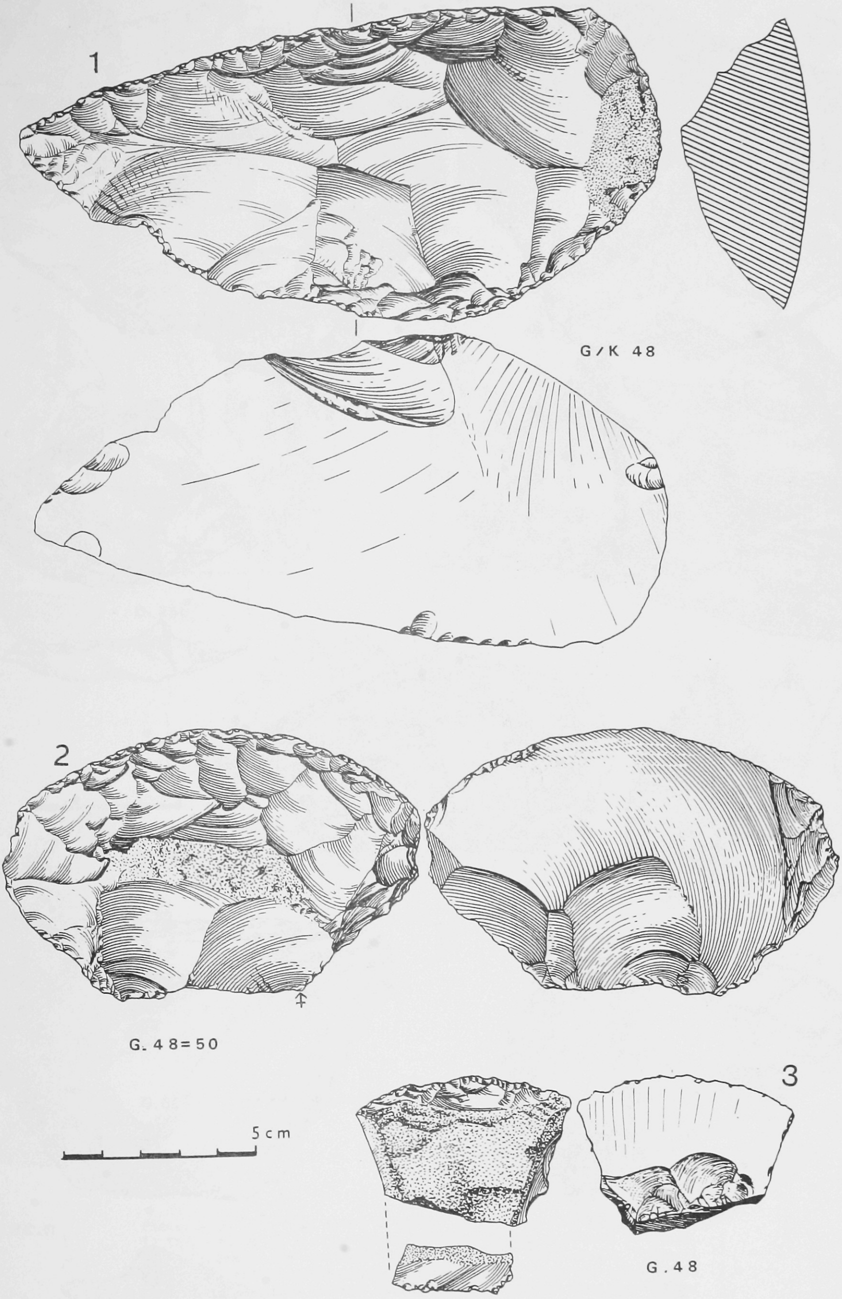



Plate C.21. All from Level C. Offset Quina racloir, transverse convex edge 17cm. long, slighter retouch on other edge. Thin, sharp point on left extremity, Clactonian notch on one edge; bulb removed, plano-convex in section, slightly 'rocking-chair'. Upper surface perhaps partly prepared on the core (compare with butt retouch on Plate C.22, no.1). See also Fig.C.12. 2) Transverse racloir, Quina retouch, on 3.2cm. thick transverse flake, with butt removed by bold, alternate flaking (point on left extremity broken off in antiquity and re-worked by squamous retouch on the lower surface). 3) Transverse convex racloir on a small cortex flake, with bulb thinned on the inverse and the edge limited by méplats.

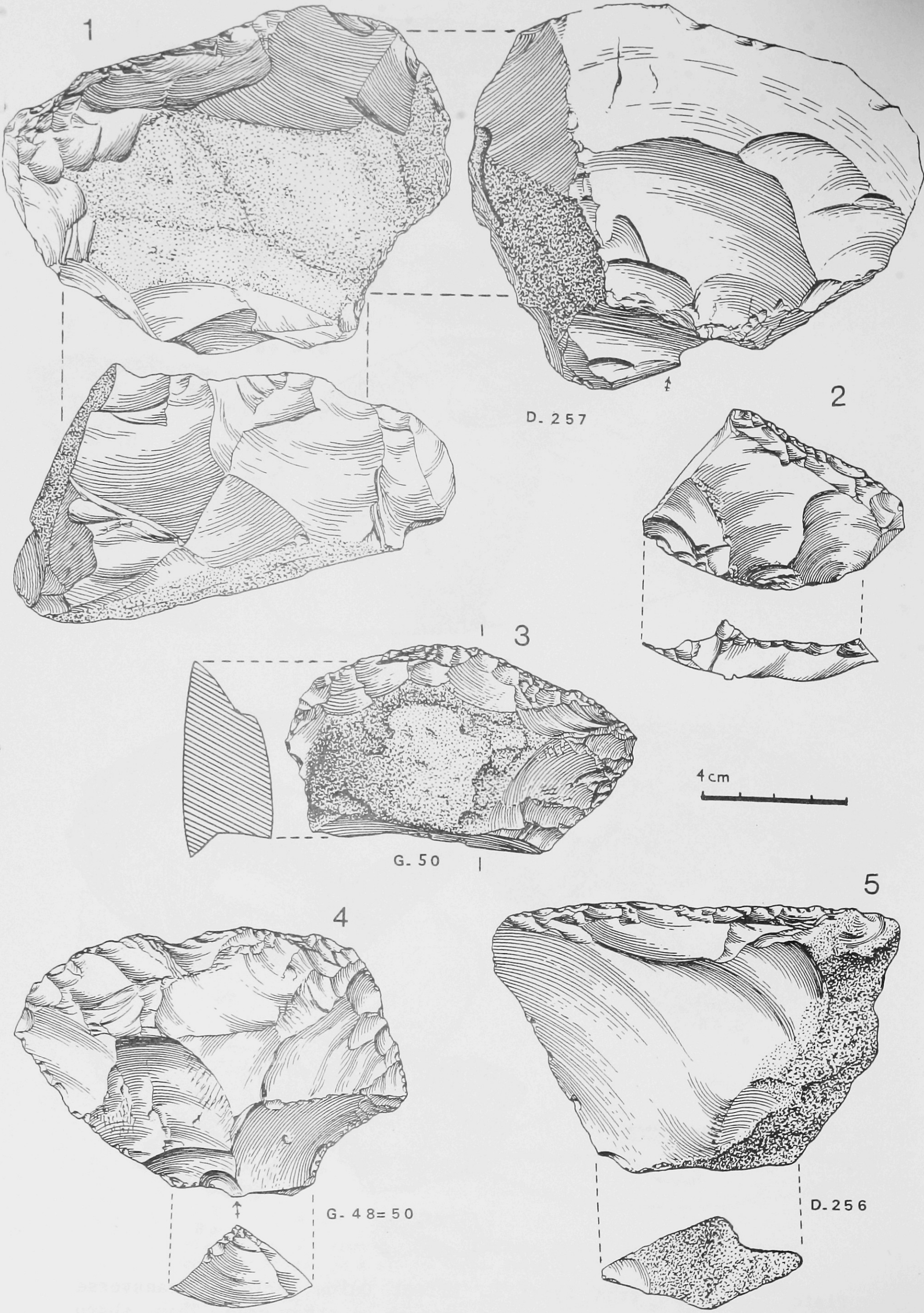



Plate C.22. All from Level C. 1) Massive scraper on heavy transverse flake, huge faceted butt (evidence of core-preparation) and bulb thinned by extensive inverse retouch (right-hand view); Note: Uppermost area on right view is remains of flake-surface. 2) Small transverse concave racloir, with edge limited by two méplats. 3) Transverse convex racloir, or an offset racloir on a tabular cortex-flake (orientation unclear). Retouch on the lower edge is abrupt, and it is Quina on the upper edge. 4) Transverse convex racloir, with rough Quina retouch and Clactonian notch near butt. Left lower edge is abrupt, and distal edge has been broken and re-worked. 5) Transverse straight (or very slightly concave) racloir, on a flake with cortex butt and knife-edge on left side. The bulb is pronounced, and the piece will rock from edge to edge.

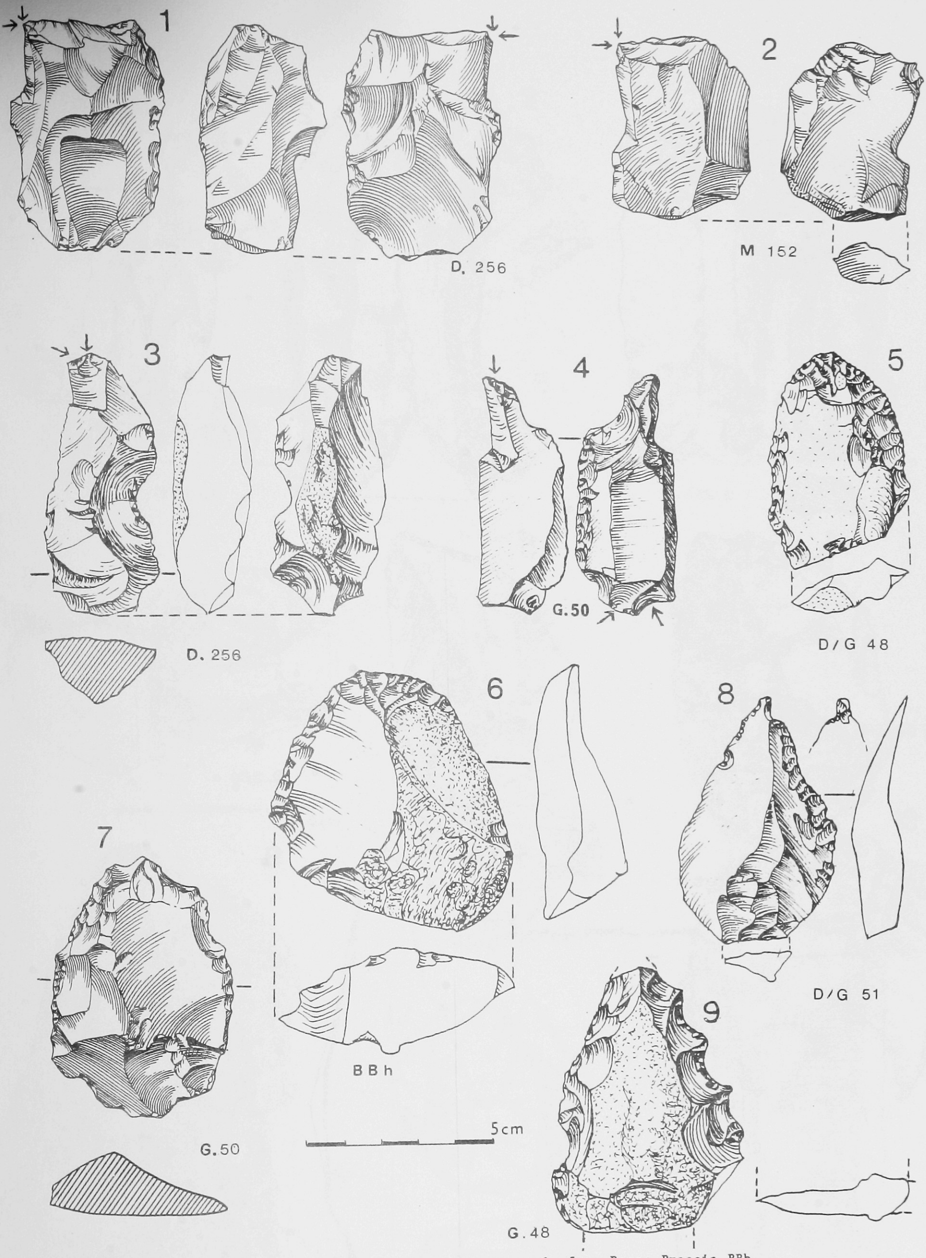



Plate C.23. All from Level C except no.6, from Bezez Breccia BBh. 1) Three views of a right-angle dihedral burin on a core or chunk. Wide (1.2cm.) and straight burin edge. 2) Right-angle dihedral burin on a thick non-Levallois end-bulb flake, with refreshed edge. 3) Dihedral oblique offset burin, on an irregular buttless cortex blade with triangular section (primary preparation facet) and two Clactonian notches - one lateral inverse, and one proximal (on which may also be a burin facet). 4) Double burin/racloir composite. At one end is a burin on an oblique truncation, and at the other is an Adlun burin (burin on a notch). One lateral edge has straight racloir retouch. 5) Typical carinated end-scraper with ogival front, on a thick cortex flake with irregular, slightly denticulated lateral retouch. 6) Slightly carinated end-scraper on a retouched flake, with asymmetrically placed ogival front. Irregular retouch on lateral edge, very thick plain butt. From Bezez Breccia BBh. 7) Denticulate, with thin teeth on a rough and slightly abraded non-Levallois flake. 8) Atypical perforator/single concave racloir composite, with broad, sharp extremity on very thin tip. 9) Denticulate with thick teeth, broken at tip, but might have been a convergent form (pointe de Tayac); plain butt, broken at right; cortex upper surface.

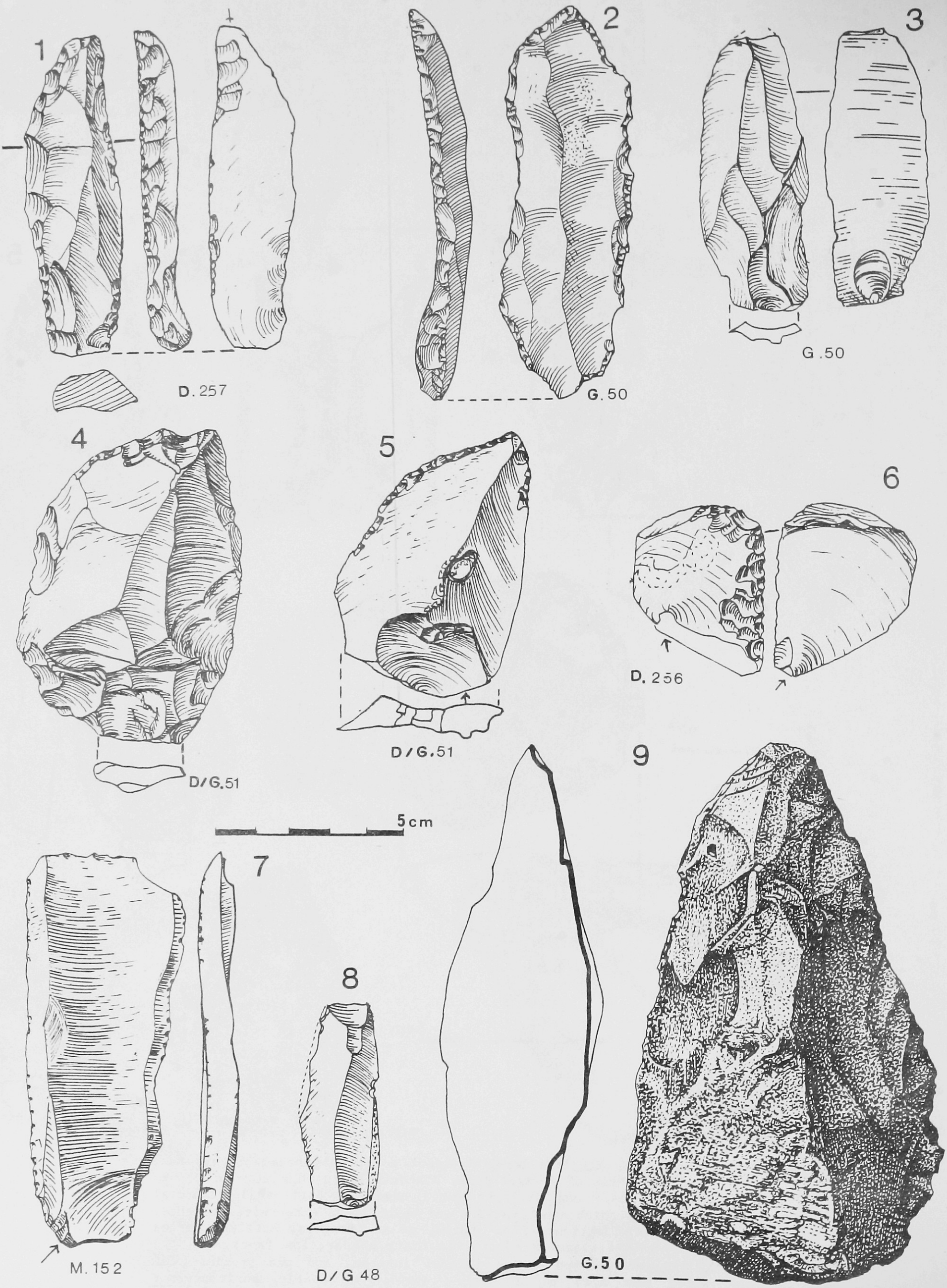



Plate C.24. All from Level C. 1) Typical backed knife, on a transverse core-preparation flake made into a blade by abrupt direct retouch. Abrupt back shown on central view. 2) Atypical backed knife, on a rolled (Levallois?) blade with a thin, abrupt back (left view). 3) Unretouched Levallois blade with accidental removal over bulb. 4) Distal notch on a thick non-Levallois point, with butt thinned from the upper surface, passing to atypical backed knife (but left distal retouch is semi-abrupt). 5) Nibbled piece; fine abrupt retouch on distal lateral edge of thick non-Levallois point with butt thinned on upper surface, as in no.4. Ridge from core-preparation on upper surface. 6) Single straight racloir, on a Kombewa flake, i.e. with two bulbs, one on each face of proximal end. 7) Naturally-backed knife, on a non-Levallois

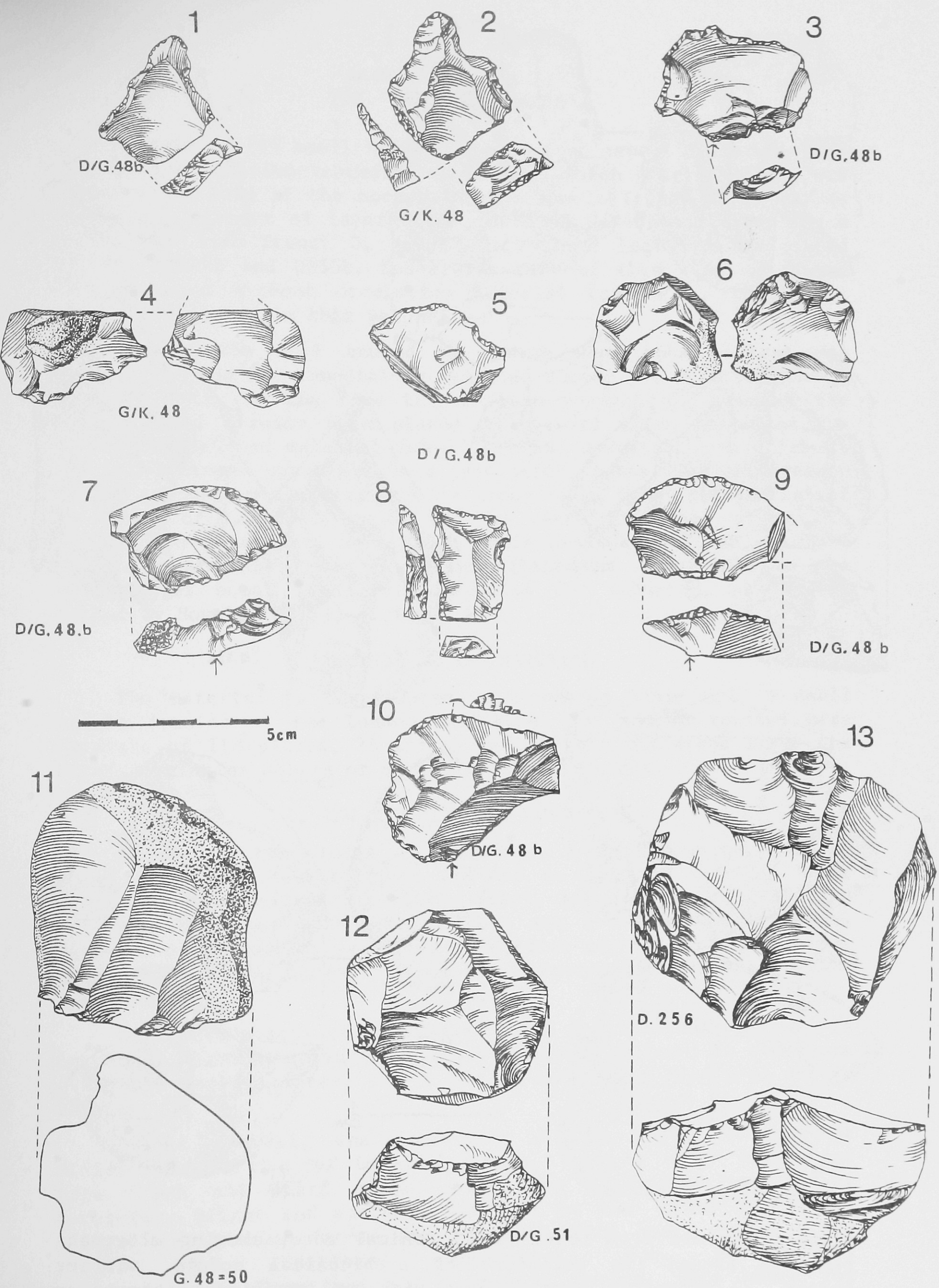



Plate C.25. 1-10) "Tayacian flakes and cores", discussed in the text: see Appendix II to this section. 11) Level C. Prismatic core on a split pebble (lower view is outline of flat base); blades were struck off around three sides from base, which has a pronounced negative bulb of percussion. 12) Level C. Base of small (5.0 x 5.3 x 3.2cm.) exhausted core, tending towards a Levallois core, but classed as a discoid. 13) Level C. Base of worked-down Levallois core with conical cortex base and centripetal flaking on upper surface. Trace of possible re-use as racloir on right edge.

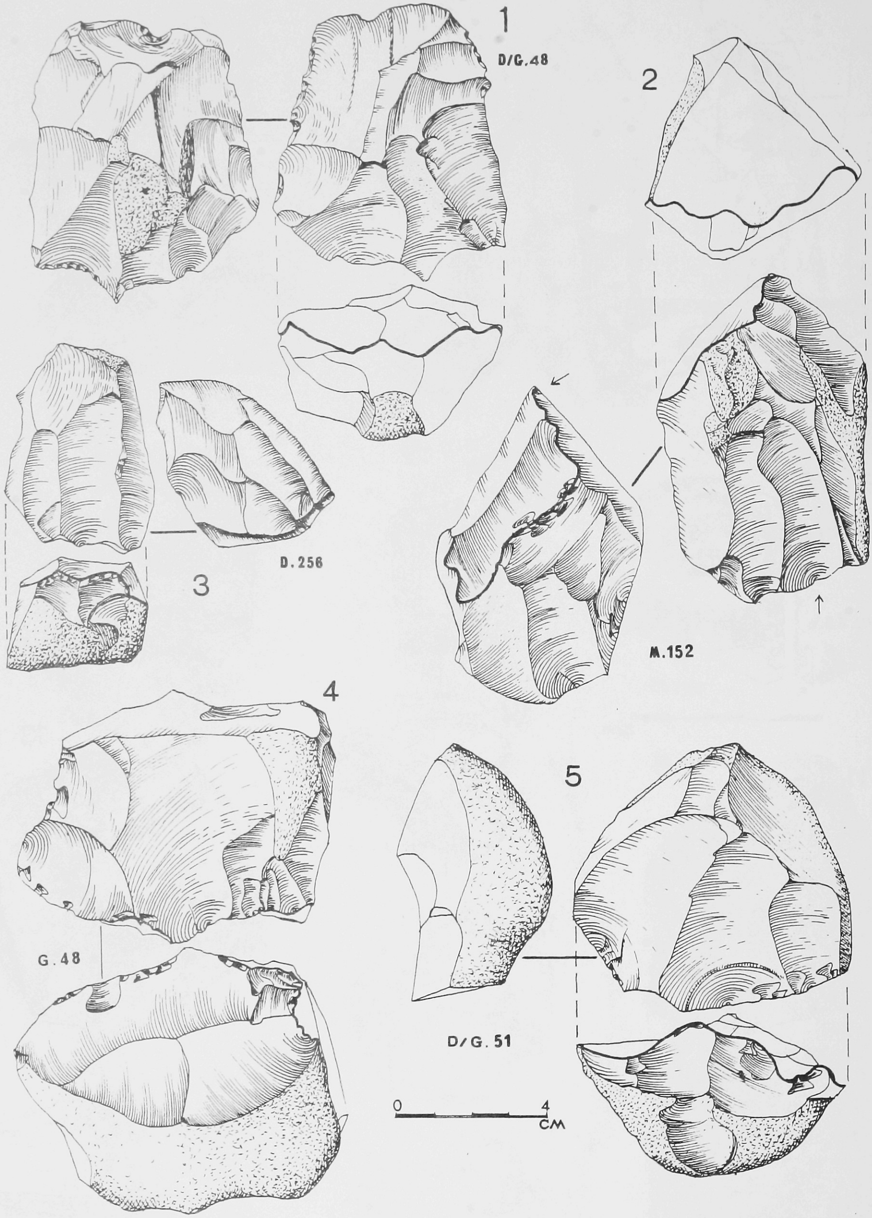



Plate C.26. All from Level C. 1) Conical core, showing alternate removals around the periphery of a biconical nodule, without cortex. 2) Prismatic bipolar core with two striking-platforms on transverse axes. Traces of a core-preparation ridge on left-hand view; cortex base; three blades removed from each of the striking-platforms. 3) Prismatic unipolar core for small blades, reminiscent of Amudian core-types. The striking-platform has been refreshed and is now roughly faceted. 5.6 x 3.5 x 3.1cm. 4) Double core, described in the text, p.101. 5) Levallois core, unidirectionally prepared type, for points or blades. One simply faceted platform; three flakes removed, from a summarily-prepared upper surface.

## APPENDIX A
## THE 'TAYACIAN FLAKES'

A group of 144 small flint pieces, of an aspect different from that of the Acheuleo-Yabrudian in Level C which overlies them, was found at the base of the occupation horizon in Trench G, in a zone restricted to part of layer D/G48, part of G/K48, and extending a little way into Trench D, layer D255; these loci are designated D/G48b, G/K48b and D255b. Underlying part of this zone was layer G50a, a sand without occupation material (sample n. in Dr Ian Cornwall's report in this volume).

Because the soil showed no change when this horizon was reached, it was not immediately detected during the excavation as a separate unit. By the time it had been recognised, some of the material had already been placed in baskets which contained the Acheuleo-Yabrudian material found the same morning, from which it had to be picked out again on a typological basis. For this reason the excavators, while setting this group aside from the material of the rest of Level C, could not be certain whether or not it represented a separate entity. In their minds, of course, was the thought that this group might be related or comparable to the material of basal Tabun: the Tayacian (or Tabunian, as it was called by Howell (1959)) of layer G.

### ANALYSIS OF THE MATERIAL

The material is distributed as shown on Table C.1. A small sample remains at the London Institute. The sample studied here consists of 118 pieces, 26 pieces having been discarded after the first sorting as débris or unrecognisable fragments.

### 1. RAW MATERIAL AND CONDITION

About half the pieces were of flint patinated white, many of them being also desilicified; another c. 25% are made of beige chert, or fine-grained Nummulitic flint, and the other c. 25% are of shiny beige or buff flint. There are a few skewbald pieces. Lumps of dark brown or sandy red concretion adhered to most pieces. These features are spread through the 3 groups (i.e. D/G48b, G/K48b and D255b).

The percentage of patinated and desilicified pieces is certainly higher than in the overlying layers of Level C; there are also more broken pieces, and a few of these have fractured due to burning.

Viewed overall, the condition of the edges is somewhat different from that of Level C pieces. While a small percentage have fresh and sharp edges, many more show ébrechures, i.e. irregular, slight and sporadic retouch; in some cases the ridges between the retouch facets are smoothed (from heavy use?). A few pieces have additional (accidental, i.e. podolithic?) pseudo-retouch, sometimes in a fresher patina. This makes for difficulties in classifying many of the retouched pieces, even up to the point where we cannot say whether it is a minimum or a maximum number of tools that appears in Table C.12.

| Categories | D255b | D/G48b | G/K48b | Class Totals | Gen. Totals |
|---|---|---|---|---|---|
| A. Nuclei | | | | | |
| 1) Cores: | | | | | |
| Discoid | | 1 | | 1 | |
| Fragments of cores | | 1 | 1 | 2 | 3 |
| B. Products | | | | | |
| Flakes used as cores | 1 | 2 | 1 | 4 | 4 |
| Levallois flakes and points | 4 | 3 | | 7 | |
| Levallois blades | 3 | 1 | 2 | 6 | 13 |
| Non-Levallois flakes | 12 | 14 | 6 | 32 | |
| Non-Levallois blades | 2 | 3 | 1 | 6 | |
| Non-Levallois flake-butts | 2 | 6 | 3 | 11 | |
| Non-Levallois flake fragments | 9 | 8 | 2 | 19 | |
| Non-Levallois blade butts | | 1 | | 1 | |
| Non-Levallois blade fragments | 1 | | | 1 | 70 |
| C. By-Products | | | | | |
| Biface-preparation flakes | 3 | 3 | 1 | 7 | |
| Pseudo-Levallois points | | 1 | 1 | 2 | |
| Core-preparation flakes | | 1 | 1 | 2 | |
| Refreshment flakes | 1 | | | 1 | 12 |
| D. Débris | | | | | |
| Fragments | 5 | 5 | 2 | 12 | |
| Chunks | 1 | 3 | | 4 | 16 |
| Technical totals | 44 | 53 | 21 | 118 | 118 |

Table C.11: Technical analysis of 118 'Tayacian' artifacts.

| List of tools | D255b | D/G48b | G/K48b | Class Totals | Gen. Totals |
|---|---|---|---|---|---|
| Levallois Tools: | | | | | |
| Flakes | 3 | 2 | | 5 | |
| Blades | 3 | 1 | 1 | 5 | |
| Points | 1 | 1 | | 2 | 12 |
| Mousterian Tools: | | | | | |
| Pseudo-Levallois points | | 1 | 1 | 2 | 2 |
| Racloirs: | | | | | |
| Single straight | 1 | | | 1 | |
| Single convex | | 1 | | 1 | |
| Double straight | | | 1 | 1 | |
| Biconvex | | 2 | | 2 | |
| Transverse | 1 | | 1 | 2 | |
| Inversely retouched | 1 | | | 1 | |
| Abruptly retouched | | 1 | | 1 | 9 |
| End-Scrapers: | | | | | |
| Atypical | | 1 | | 1 | 1 |
| Notches and Denticulates: | | | | | |
| Notched pieces | | 6 | 3 | 9 | |
| Denticulates | | 5 | 1 | 6 | 15 |
| Retouched pieces: | | | | | |
| Abrupt, thin retouch | | 2 | 1 | 3 | |
| Semi-abrupt, thin retouch | | 2 | | 2 | 5 |
| Total tools | 10 | 25 | 9 | 44 | 44 |
| Unretouched flakes, blades and fragments | 27 | 17 | 8 | 52 | 52 |
| Cores | 1 | 3 | 2 | 6 | 6 |
| Débris | 6 | 8 | 2 | 16 | 16 |
| Unit totals | 44 | 53 | 21 | 118 | 118 |

Table C.12: Typological analysis of 118 'Tayacian' artifacts.

| Type of blank | Type of butt: Plain or cortex | | | Faceted | | | Dihedral | | | Linear or lipped | | | Shattered or punctiform | | | Thinned or removed | | | Absent | | | Unrecognisable or broken | | | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layers | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | D 255b | D/G 48b | G/K 48b | |
| <u>Levallois</u>: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Levallois flakes | 2 | | | 1 | 2 | | | | | | | | | | | | | | 1 | 1 | | | | | 7 |
| Levallois blades | 2 | | | | | 1 | | | | | | | | | | | 1 | | 1 | | | | | 1 | 6 |
| Total Levallois (amalgamated) | 4 | | | 4 | | | | | | | | | | | | 1 | | | 3 | | | 1 | | | 13 |
| <u>Non-Levallois</u>: | | | | | | | | | | | | | | | | | | | | | | | | | |
| Non-Levallois flakes | 9 | 13 | 3 | 1 | 3 | 1 | 1 | 1 | | 1 | 3 | | 1 | 1 | 1 | 1 | 1 | 2 | 5 | 8 | 3 | 7 | 4 | 4 | 74 |
| Non-Levallois blades | 1 | 3 | | | | | | | | | | | | | | | | | 3 | | 1 | | 1 | | 9 |
| Total non-Levallois (amalgamated) | 29 | | | 5 | | | 2 | | | 4 | | | 3 | | | 4 | | | 20 | | | 16 | | | 83 |
| Total blanks | 33 | | | 9 | | | 2 | | | 4 | | | 3 | | | 5 | | | 23 | | | 17 | | | 96 |

Table C.13: Butt analysis and morphology of blanks: 'Tayacian' artifacts.

## 2. TECHNICAL ANALYSIS

### A. CORES

The cores form a poor and meagre group; for their distribution, see Table C.11.

DISCOID CORES, 1 (Plate C.25, no.4)

This is an exhausted core, broken at the tip, discoid in plan, with cortex back, in white patinated flint. It is 1.4cm. thick.

DIVERS CORES, 4 (Plate C.25, no.6)

These all appear to be small cores on flakes, with a single striking platform. On the drawn piece (3.4 x 3.7 x 1.2cm., white patinated flint) the butt is on the upper right edge of the left-hand view; a small flake has been struck off from the distal end, the removal scar being in the original main flake-surface. On another piece, of similar origin, the butt and bulb are themselves absent (4.6 x 4.5 x 2.7cm., white flint). Another is made on a thick cortex flake - in this case the butt has been thinned by two blows from the base (4.2 x 3.7 x 1.4cm., beige matt chert).

CORE FRAGMENTS, 2

Both have traces of multi-convergent preparation on the upper surface and cortex on the back. The striking-platforms are plain.

### B. PRODUCTS

The distribution of the various kinds of flake is set out in Table C.11. Aside from 16 small pieces whose status as artifacts remains open to doubt, and four flakes which were used as cores, there remain 95 flakes, blades and fragments to consider. Table C.13 gives the butt and morphology of the blanks, and Figs.C.23 and 24 show the absolute length and breadth measurements in scatter diagrams; in the latter, the measurable flakes of the three 'Tayacian' units in Bezez C were amalgamated, and are compared as a group to corresponding measurements from two other so-called Tayacian groups - the Tayacian of Tabun G, and that of Oumm Qatafa G and E (Neuville, 1951). In order to obtain the Qatafa measurements, the drawings on Neuville's plates were restored to natural size and measured. The same was done for some of the Tabun pieces, while others were physically measured in the British Museum.

The technical indices are shown in Table C.11. It can be seen that in some technical aspects, the 'Tayacian' flakes of Bezez C resemble those of the other industries at Adlun (except the Amudian); the indices fall within the range of both the Beach Industry at Abri Zumoffen and the Trench G layers, for example.

The impression is gained that the small group of Levallois flakes were not struck from unidirectionally-prepared cores, but from broad flake cores. This is borne out by the by-products and by the presence of other small non-Levallois flakes, which are characteristic products of the use of ex-Levallois, now Mousterian, discoid cores (i.e. without permanent striking-platform). The two

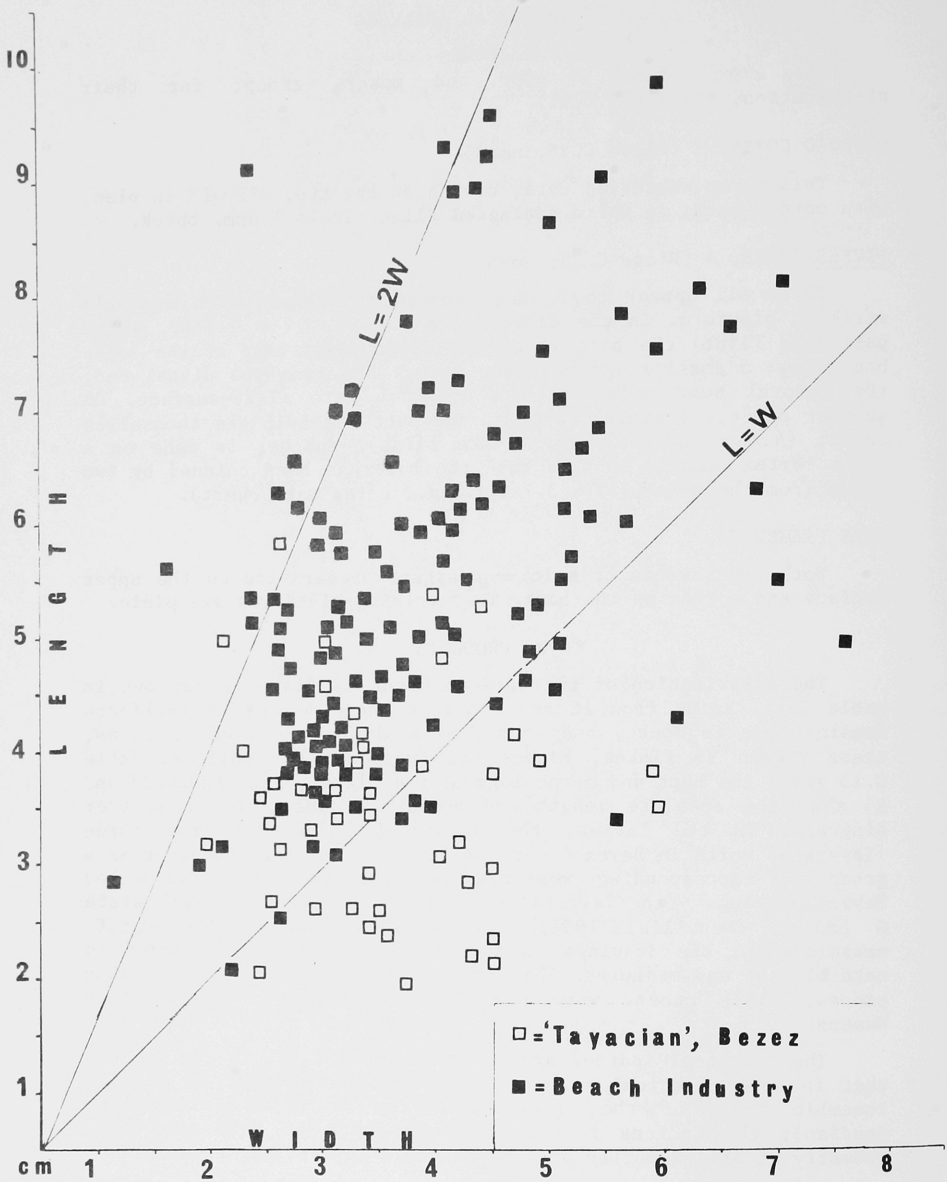



Fig.C.23. Comparison of the length and width distribution of the 'Tayacian' flakes from Bezez with flakes of Beach Industry units, Abri Zumoffen.

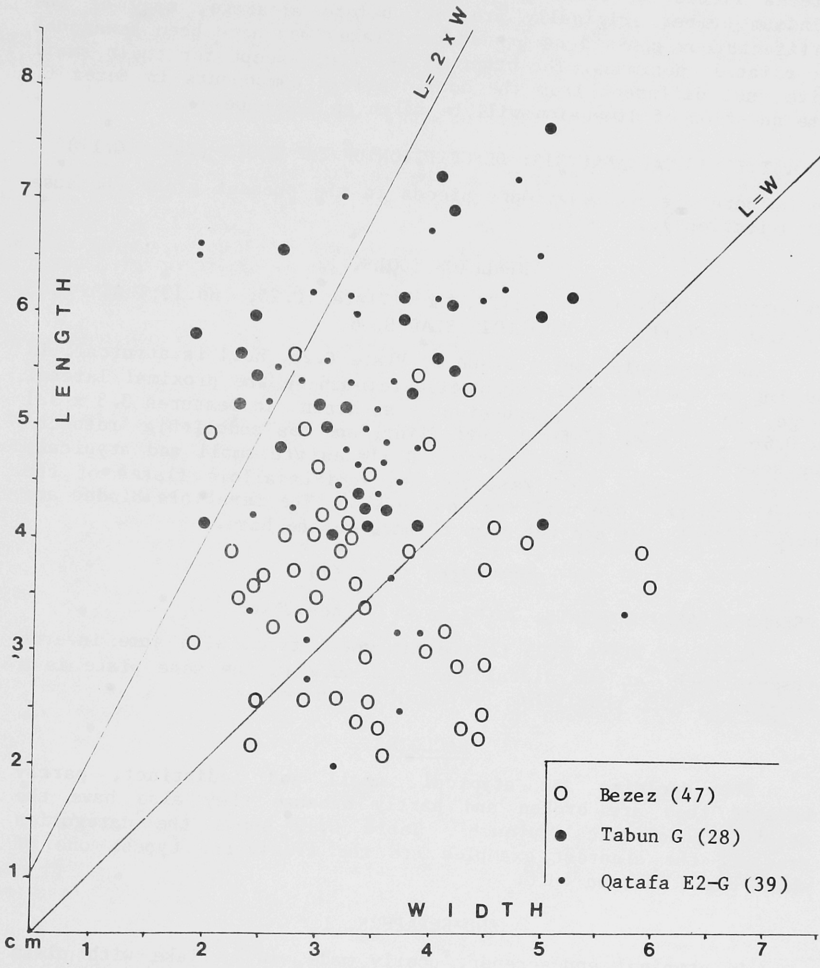



Fig.C.24. Comparison of the length and width distribution of the 'Tayacian' flakes from Bezez with Tayacian flakes from Qatafa and Tabun.

pieces listed as pseudo-Levallois points probably represent the minimum number originally present; before breakage, many of the artifacts now classed as transverse flakes may have been hexagonal or pointed specimens. The other flakes are, except for their small size, not different from the non-Levallois components in Bezez C. The question of dimension will be taken up again below.

3. TYPOLOGICAL ANALYSIS: DESCRIPTION OF THE TOOLS (Table C.12)

There are no Heavy-duty pieces in the present group (because of selection?).

LEVALLIOS TOOLS, 12

TRIANGULAR LEVALLOIS POINTS, 2 (Plate C.25, no.1); ATYPICAL LEVALLOIS FLAKES, 4; LEVALLOIS BLADES, 6

The triangular point drawn in Plate C.25, no.1 is atypical, in having an area of core-preparation retouch on the proximal lateral edge, but the axis of percussion is as drawn. It measures 3.3 x 3.1 x 0.6cm., is made of fresh buff flint, and has podolithic 'retouch' on some edges. All the unretouched flakes are small and atypical; in some respects, they resemble the semi-Levallois flakes of the Beach Industry (see next section, p.218). The Levallois blades are more typical, but one has been thinned on the base.

MOUSTERIAN TOOLS (2)

PSEUDO-LEVALLOIS POINTS, 2 (Plate C.25, nos.2 and 10)

No.10 in Plate C.25 is the hexagonal type, with some inverse 'use-retouch' at the distal end, and no.2 in the same plate is a sub-point, with podolithic 'retouch' on the edges.

RACLOIRS

The racloirs are atypical, small and indistinct, partly because they are broken and partly because they also have the possibly-podolithic 'retouch'. Table C.12 shows the categories present; the clearest examples are the transverse types, one of which has a thinned butt.

END-SCRAPERS, 1

An atypical end-scraper, poorly made, on a flake with plain butt.

NOTCHES AND DENTICULATES (15)

NOTCHED PIECES, 9 (Plate C.25, no.8)

The drawn piece is burned, has a greasy shine, and is made on a core-preparation flake; the notch is thin, on the lateral edge. Another has a notch on a core-fragment; one is made on a biface-preparation flake. Two pieces have thinned butts, with the notch placed distally on a transverse edge.

DENTICULATES, 6 (Plate C.25, nos.3 and 5)

These are also indistinct, for the same reasons as were the racloirs. They are made on small non-Levallois flakes. One has abrupt retouch, and is in fact a re-worked racloir.

RETOUCHED PIECES, 5 (Plate C.25, no.9)

Two have thick 'Clactonian' butts on transverse flakes (Plate C.25, no.9), 1.2cm. thick. The retouch is marginal, parallel, semi-abrupt. Two are on blades, one having the retouch on a broken edge. One has mixed semi-abrupt and abrupt retouch on both edges, and one piece has nibbled abrupt retouch, slightly denticulated, as on some Amudian pieces at Abri Zumoffen; however, it is made on a biface-preparation flake with a distinct curve in profile.

This completes the list of tools; there remain:

UNRETOUCHED FLAKES (52)

Of the seven biface-preparation flakes listed in Table C.11, three were made into tools; the remainder have either shattered or lipped butts, two being typical and the other two less so - they could have been struck from a core rather than from a biface, but they are certainly éclats de taille. The refreshment flake was apparently struck from a discoid core. The core-preparation flakes are flakes on which a part of the core came away on the lateral edge, forming either a central ridge or a vertical back. There is one 'double flake-surface flake' - a flake on which there is a "flake-surface" on both faces although only one bulb is visible; clearly, this was struck from the ventral surface of a flake. One may comment that the flakes of this group somewhat resemble those in the Beach Industry of Abri Zumoffen (see Section II), but the latter are made from a different kind of flint.

DEBRIS (16)

As mentioned above, these pieces are unclassifiable fragments, of which four need not necessarily be artifacts at all, four may be core-débris and three are desilicified beyond recognition; there are also three angular chunks, one of them burned.

ANALYSIS OF THE ASSEMBLAGE

The small sample precludes detailed analysis. There is little typological relationship between the retouched 'Tayacian flakes' and their counterparts in the Level C layers, except that the number of racloirs and Mousterian pieces equates well with those of M152. The list of tools is too restricted to produce a cumulative graph, but one was constructed experimentally for the real list of tools; the following observations are worth making:

1 The curve bore no relation to that constructed by R.S. and R.L. Solecki (1966) for the Shemsian industry of Yabrud Shelter IV, shown in their Fig.37 (op.cit., p.68); the two greatest differences derive from the scarcity of Levallois pieces at Yabrud IV (less than 5% against 22% at Bezez), and the absence of naturally-backed

knives - or indeed knives of any sort - at Bezez, compared to 28.4% at Yabrud IV.

2 The curve bore a close resemblance at the outset to one experimentally drawn up for the unpublished Tayacian of Ras Beirut (Fleisch and Sanlaville, 1969); types 1 - 21 were almost identical, for example. However, Bezez has racloirs types 22 - 29 and no knives, while naturally-backed knives amount to c. 30% in the Cordon Littoral at Ras Beirut (H. Fleisch, pers.comm., 1969).

3 The curve had little in common with that of Bed 80 (now Bed 90) at Tabun (Jelinek, 1975). Unfortunately, we have no data that would enable us to make the same comparison with the Tabun G or Qatafa E2-G artifacts. To judge by the published accounts and illustrations, however, the distinctive Tabun G industry has more racloirs than the Bezez assemblage, while Umm Qatafa (Neuville, 1952) resembles Bezez even less, though for quite different reasons: for example, it has a restricted tool-list, in which there are many naturally-backed knives and blades. The IL for both these industries would probably prove to be much lower than at Bezez.

## TECHNICAL COMPARISON WITH OTHER 'TAYACIAN' OCCURRENCES

Although the samples are small, and not ideally representative, a comparison of the dimensions of the flakes of the Bezez 'Tayacian' with those of Tabun G or Qatafa E2-G does suggest that we are dealing at Bezez with a morphologically different assemblage; in contrast to the typological data, its dimensions are somewhat further from those of Tabun than from those of Qatafa (see Figs.C.23 and C.24). The former figure indicates that, while there is a morphological difference between the Beach Industry flakes and those of the 'Tayacian', there is a considerable overlap. Basically, the smaller size and larger number of transverse flakes (those on the right of the Length = Width line) sets the Bezez assemblage apart from the others, and from the other Level C layers.

Although Pre-Mousterian assemblages of flakes without bifaces have been not infrequently reported from the Levant, little is known of them with the exception of those which have been excavated (e.g. from Qatafa E, Tabun G, Yabrud IV, Yabrud I, 15 etc.). On the littoral, these flake facies are usually embedded in hard breccias or calcareous crusts (as at Harf el-Mosri, Masloukh lower layer and Dahr el Aazziyé) and consequently the collections are inclined to be very small; at Bahsas and Ras Beirut II (Cordon Littoral), they are found in unconsolidated deposits but have not been published. In all cases these occurrences are associated with marine or continental deposits dating from Jbailian to earliest Enfean times (references in Hours, 1975; 1981). Dahr el Aazziyé is only 11km. south of Adlun; here, a marine beach at an altitude of 50 - 60m., most probably Jbailian I, is sealed by a calcareous crust nearly 2m. thick, which must post-date it. The crust contains flakes which in the opinion of Père Fleisch are of Tayacian type and could date from the 'Riss' or perhaps the Enfean at the latest (Sanlaville, 1977, pp.682 and 693). We mention this occurrence only to call attention to the fact that the so-called 'Tayacian' artifacts are

consistently referred to pre-Enfean II times and, to record that the region of Adlun is not without such occurrences.

## CONCLUSIONS

It is perhaps not surprising to find that the Bezez 'Tayacian' assemblage does not greatly resemble the other 'Tayacian' industries in the Levant, when it is remembered that the latter occur stratigraphically below an Acheulean in two cases (Tabun in level G and Oumm Qatafa in levels E and D2) and associated with a Jbailian II sea-level at a third site, Ras Beirut, while at Bezez the 'Tayacian' was found below an Acheuleo-Yabrudian which should be roughly the same age as Tabun upper E.

We think it appropriate to stress the following points:

1 the apparent age-difference between the Bezez assemblages and the other Tayacian occurrences;

2 the typological and morphological differences noted above;

3 the undeniable points of technological comparability between the Bezez Tayacian and some of the assemblages at Adlun, e.g. transverse flakes, thinned butts, percentage of Levallois débitage etc.;

4 the presence of by-products of knapping, such as core-fragments and preparation-flakes;

5 the general poverty (restricted tool-count, blurring of types) and bad condition (natural edge damage, desilicification) of the assemblage;

6 the high percentage of débris (28 pieces discarded from the first sorting and another 16 from the second).

Keeping all these factors in mind, we conclude that we are dealing with some sort of residue of an Acheuleo-Yabrudian industry like the one that is itself so well seen in the overlying layers; indeed, were the 'Tayacian' flakes to be added to those of the rest of Level C, they would supply an element of small flakes now missing from Level C and this would simply complete the range of dimensions normally found in the flake component of flint industries; for example, such an element is present in the Yabrudian of El-Koum and Yabrud. Nevertheless, the actual findspot of the material right at the base of the Acheuleo-Yabrudian occupation deposits certainly leaves open the possibility that this assemblage could belong to an occupation of Bezez earlier than that of Level C proper (Enfean I?). It seems best to leave the question open until further excavation can clarify the stratigraphic position of the artifacts and provide a larger sample, much as we would have preferred to reach a definite conclusion here and now.

## APPENDIX B
## THE BRECCIA BLOCKS

### INVENTORY OF BRECCIA BLOCK BBh

This block of breccia measured c. 25cu.m., and was taken from the sill of Bezez Cave; see section, Fig.S.1. When broken up, the block produced 10 artifacts, some of which were broken during the process of extraction from the extremely hard matrix. The flint was unpatinated and the pieces had sharp edges, and were covered with yellow and grey concretions, crumbly in parts, which did not entirely vanish when dipped in dilute hydrochloric acid. The pieces appear to be Yabrudian in character, and the location of the block suggests that it may have been a continuation of the Trench D layers. It contained:

1 end-scraper on a heavy flake of Eocene flint with large plain butt (Plate C.23, no.6).

1 bifacial racloir on a heavy flake of brown flint; the butt and side have been thinned inversely, and there is a large inverse notch.

1 single concave racloir (? with single-blow burin) on a grey flint flake with plain butt.

1 double convex-straight racloir, possibly a convergent before the tip was broken off; it has a straight faceted butt. It and the next racloir are of skewbald flint.

1 double racloir, probably offset, but now lacking the tip and the butt.

1 retouched Levallois flake - a thin flake, with the butt concealed under concretion.

2 retouched fragments, both on skewbald flint. One may be the tip of an end-scraper or convergent racloir. The other is a non-Levallois flake, with faceted butt.

1 unretouched flake fragment and 1 chunk (débris).

One of the double racloirs had the 'greasy shine' which, according to J. Tixier (pers.comm.), indicates that the piece has been heated, either accidentally or intentionally.

### BRECCIA BLOCK BBf

This block was attached to the wall of Bezez Cave near the mouth (Fig.S.1). Two artifacts were recovered, an amorphous core in skewbald flint, and a short, thick flake of beige flint with Clactonian butt. Their appearance is not inconsistent with a Yabrudian attribution.

### BRECCIA BLOCK BBa

This was found at 16.9 - 17m., on the low shoulder on the south side of the mouth of Bezez Cave (Fig.P.1, p.394). Two artifacts were extracted, one a small double racloir with Quina retouch on a buff flint flake with thinned butt, and the other a black, burned flint fragment. Both could be referred to the Yabrudian.

## BRECCIA BLOCK BBb

This chunk was taken from the sill, against the shoulder of BBa, at 16.25m., on the south side of the cave mouth (Fig.S.1, p.43). It appears to represent a hearth horizon, and contains bone (charred and uncharred) and wood charcoal, as well as sparse flints. These consisted of: 2 cores, one non-Levallois blade, six flakes with plain or damaged butts, and five unrecognisable flake fragments, two of them burned. A large (?equid) tooth was also found. The material could perfectly well be Yabrudian, but is not clearly diagnostic.

# CHAPTER 4
## SECTION II
## THE AMUDIAN BEACH INDUSTRY AT ABRI ZUMOFFEN

### INTRODUCTION

Before considering the sequence of levels in Bezez Cave, where the next one would be the Mousterian of Level B, it was felt preferable to deal first with some chronologically earlier material at the site adjacent to Bezez, Abri Zumoffen; therefore, in this chapter we move from Bezez to the rock-shelter about 68 paces to the north, where the deposits are broadly referable to the Yabrudian phase and to Bezez C.

The stratigraphy of Abri Zumoffen was reviewed in Chapter 3, Section II, where we also mentioned the reasons for re-evaluating the artifacts, particularly the Beach Industry. In 1971 the British School of Archaeology in Jerusalem, which had sponsored the excavations at Adlun, authorised the writer to examine the artifacts, which are all kept at the National Museum, Beirut. The Beach Industry in Trenches A and C, which we felt might have been rather overshadowed in the 1961 report by the fuller treatment of the Amudian and Yabrudian artifacts, is the main subject of the following study; the sample consists of 511 artifacts. In addition, some of the Amudian layers immediately overlying it in Trench A and Trench C will be described, as a check on the typology. Unfortunately, neither all the Trench B artifacts nor those from the overlying Yabrudian layers could be studied in detail in 1971 in the time available, but a careful visual examination was made and certain features noted. A sample from B, Q-R and Zumoffen Cave (L-Q) is also included.

### TERMINOLOGY AND METHOD

The term Beach Industry is used in the sense of the excavators (Garrod and Kirkbride, 1961) to denote the material in and on the fossil beaches at the base of the exposures at Abri Zumoffen. The artifacts were studied in the same way as were those of Bezez C in the immediately preceding section of this chapter: the attributes of each were recorded on index-cards, a typelist constructed, based on that of F. Hours (1974), and simple statistical analyses carried out whenever (in spite of small samples) they were judged to be useful. For comparative purposes we relied mainly on Tabun layer E, as known from Professor Garrod's material in museum collections and from Jelinek's accounts of the material of his Bed 48 (Jelinek, 1975); the writer also benefitted from being able to view the latter on a visist to Tucson in 1973.

### ILLUSTRATIONS

Some of the drawings of artifacts in the 1961 report are augmented here by giving additional views; in such cases the original drawing is repeated, reduced in scale, in a box beside the new drawing. Plates Z.1-10 show these and other hitherto unpublished pieces.

## THE AMUDIAN UNITS STUDIED

Not all the Amudian units were studied to the same degree in 1971. One unit, Level 19 in Trench A, squares X-Z, was chosen for detailed study, since it had certain advantages: it had not been amalgamated with pieces from other layers; it contained a good statistical sample of 377 pieces, and it was secure stratigraphically, well below the weathered zones, and separated from them by yet further Amudian layers 17, 15 and 13 with their intervening calcrete bands, undisturbed hearths etc. The 75 pieces of layer 3 of Trench C were also examined, giving an Amudian sample of 452 pieces.

For the purpose of making cumulative graphs, the typology of Trench A, layers 17 and 15, two Amudian units, was recorded, as was that of a possibly Yabrudian unit in Trench A, layer 9. Two other units were studied typologically - Layers 2 and 1 of Trench C, both Amudian.

To recapitulate, the following is a list of all units studied, both Beach Industry and Amudian:

Beach Industry:

- 84 artifacts from Trench A, squares N-O and P-Q ("Upper Beach")
- 357 artifacts from Trench A, squares R and S-T ("Lower Beach")
- 47 artifacts from Trench B, squares Q-R and Zumoffen Cave (L-Q)
- 22 artifacts from Trench C, layer 4

Amudian:

- 377 artifacts from Trench A, squares X-Z, layer 19
- 75 artifacts from Trench C, layer 3
- (73 artifacts (retouched tools only) from Trench A, levels 17 and 15)
- (256 artifacts (retouched tools only) from Trench C, layers 2 and 1)

?Yabrudian:

- (11 tools from Trench A, layer 9)

Regarding the Upper and Lower Beaches, it now appears from Sanlaville's work that these are geologically the same unit; since the typology of the artifacts from each also compares extremely closely, we will not use these terms in the following study except where necessary, for example when quoting the 1961 report.

## THE BEACH INDUSTRY AND CERTAIN AMUDIAN UNITS AT ABRI ZUMOFFEN

### RAW MATERIAL

There is a striking difference between the artifacts of the Beach Industry units and those of the Amudian, in that the two main kinds of flint occur in reversed proportions (Table Z.1). The Beach Industry knappers favoured a Nummulitic Tertiary Eocene honey-coloured chert, which probably originated in the limestone of the Adlun cliff-line itself (see the contribution to this volume by M.M. Sweeting). The plate-like fossil molluscs incorporated in the

| | 1 Trench A, N-O | | | | 2 Trench A, P-Q | | | | 3 Trench A, R | | | | 4 Trench A, S-T | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ret. flake tools | Unret. flakes | Cores and chopping-tools | Totals | Ret. flake tools | Unret. flakes | Cores and chopping-tools | Totals | Ret. flake tools | Unret. flakes | Cores and chopping-tools | Totals | Ret. flake tools | Unret. flakes | Cores and chopping-tools | Totals |
| Nummulitic cherty flint | | 7 | 2 | 9 | 7 | 34 | 2 | 43 | 4 | 58 | 2 | 64 | 5 | 182 | 12 | 199 |
| Grey and brown flint | 4 | 6 | 2 | 12 | 6 | 4 | | 10 | 3 | 3 | 2 | 8 | 12 | 22 | 9 | 43 |
| Piebald flint | 1 | | | 1 | | 1 | | 1 | | | 1 | 1 | 2 | 4 | | 6 |
| White patinated flint | | | | | 1 | | | 1 | | 2 | | 2 | 3 | | | 3 |
| Burned | | 1 | | 1 | | 5 | | 5 | | | | | | 17 | 2 | 19 |
| Type not recorded | 1 | | | 1 | | | | | | 5 | | 5 | 1 | 6 | | 7 |
| Totals | 6 | 14 | 4 | 24 | 14 | 44 | 2 | 60 | 7 | 68 | 5 | 80 | 23 | 231 | 23 | 277 |
| | 5 Trench B, Q-R and Zumoffen Cave | | | | 6 Trench C, level 4 | | | | 7 Trench C, level 3 | | | | 8 Trench A, level 19, X-Z | | | |
| Nummulitic cherty flint | 1 | 25 | 2 | 28 | | 4 | | 4 | 2 | 6 | 2 | 10 | | 4 | | 4 |
| Grey and brown flint | | 4 | 3 | 7 | 2 | 6 | 3 | 11 | 15 | 19 | 3 | 37 | 38 | 45 | 1 | 84 |
| Piebald flint | | | | | | | | | | | 1 | 1 | 7 | 37 | | 44 |
| White patinated flint | | | | | 1 | 1 | | 2 | 1 | 4 | | 5 | 2 | 2 | | 4 |
| Burned | | | | | | | | | | | | | 1 | 7 | | 8 |
| Type not recorded | 2 | 4 | 6 | 12 | | 5 | 1 | 6 | | 15 | 7 | 22 | 47 | 164 | 19 | 230 |
| Totals | 3 | 33 | 11 | 47 | 3 | 16 | 4 | 23 | 18 | 44 | 13 | 75 | 95 | 238 | 20 | 376 |

Table Z.1: The raw material in 6 Beach Industry (columns 1-6) and 2 Amudian units (columns 7-8)

chert give it a grainy feel and a speckled appearance; in many pieces, the Nummulite shells themselves have dissolved, leaving the flint full of small holes, which are often filled with red beach sand or secondary concretion. When this flint is patinated, its colour becomes pale grey.

The Nummulitic flint occurs at the Adlun sites in two forms: as tabular slabs from the bedrock, with thin brown cortex, and as cobbles or pebbles which have been rounded, presumably on the ancient sea-shore.

In the Amudian layers, a grey or brown matt flint was favoured. This patinates to lighter shades of grey or buff, and occurs in pebbles with a thick chalk cortex. These pebbles may have been transported along the shore from the mouth of the Wadi Abu Aswad, or from that of the palaeo-Litani river, south of Adlun, by the prevailing circum-Mediterranean currents (Emery and George, 1963).

A third type of flint was also used at Adlun, a shiny chestnut and white (skewbald) material; as Table Z.1 shows, it was not often used in the Beach units, but it was popular in Amudian layer 19; however, it was virtually absent from Trench C layers. A few pieces of grey silicious limestone were also used in the Amudian layers.

## DISTRIBUTION OF RAW MATERIALS

As already mentioned, most of the Beach Industry units consist of Nummulitic flint artifacts, with a sprinkling of brown flint pieces; the latter are usually finished tools. The average ratio (except in Trench C, where grey flint occurs throughout) is three Nummultic artifacts to each one of brown flint. Conversely, in the Amudian units, the brown flint predominates, and includes both tools and unretouched pieces. However, numbers of cores in brown flint roughly equal those in Nummulitic - e.g. in Trench A, squares S-T there are 11 Nummulitic and nine brown flint cores.

## CONDITION OF THE ARTIFACTS

Virtually all the Beach Industry pieces are patinated grey, while in the Amudian units both main types of flint are fresh and unpatinated, with the exception of those from layer 3 in Trench C, where the flint is patinated. Only 13 pieces in all were rolled, all from Trench A beaches. Several pieces in the Amudian units (especially those from hearth horizons) were calcined, metamorphosed or had pot-lid fractures and the greasy shine characteristic of heat-treatment, accidental or otherwise.

## CORES

The difficulty of distinguishing chopping-tools from discoid cores was discussed in the preceding section of this chapter. The same guide-lines are used here. The dimensions of both cores and chopping-tools are shown in Fig.Z.1, and the distribution of cores by layer and type on Table Z.2.

Beach pebbles evidently formed a convenient source of raw material for the Adlun flint-knappers and, since artifacts

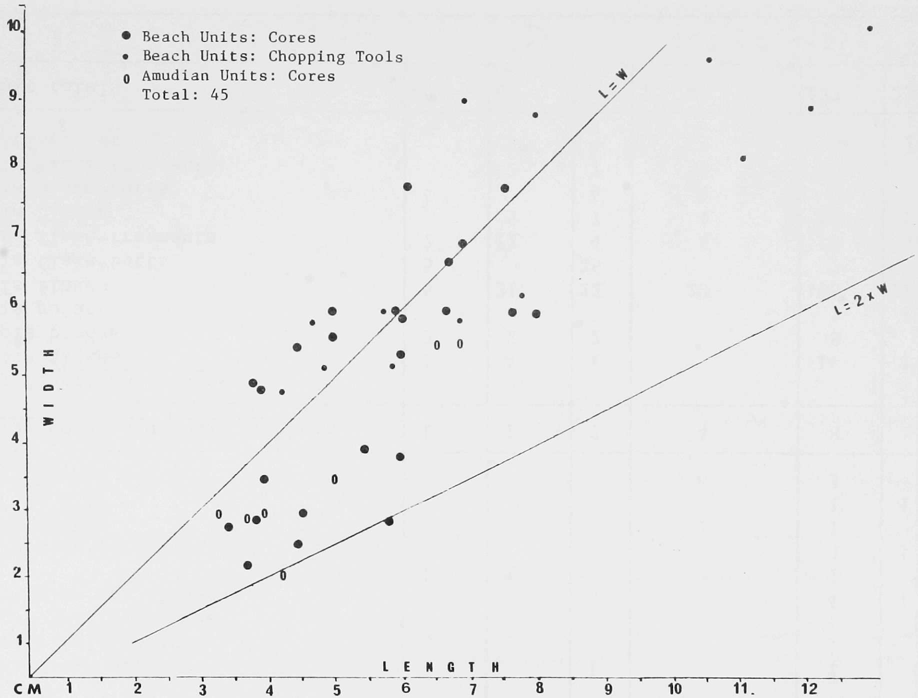



Fig.Z.1. Length/width distribution for cores and chopping-tools (Beach units) and cores (Amudian units).

| | Beach Industry Units | | | | | | Amudian Units | |
|---|---|---|---|---|---|---|---|---|
| | A, N-O | A, P-Q | A, R | Zumoffen Cave and B, Q-R | A, S-T | C4 | C3 | A19, X-Z |
| 1. Cores: | | | | | | | | |
| Summary Levallois, unipolar | | | 1 | | 1 | | | 1 |
| Summary Levallois, bipolar | | | | | 1 | | | |
| Prismatic unipolar for flakes | | | | | 1 | | | |
| Prismatic unipolar for blades | 2 | | 4 | | 4 | 1 | 4 | 12 |
| Discoid | 1 | 1 | | | 1 | | | |
| Polyhedric, double and globular | | | | | 3 | 1 | | 3 |
| Amorphous and divers | | | | 1 | 1 | | | 2 |
| Fragments | | | | | 1 | 1 | 1 | 2 |
| Core débris (chunks) | | | | 6 | 3 | | 7 | |
| 2. Heavy-duty tools, and tools on cores | 1 | 1 | 2 | 4 | 8 | 1 | 1 | 1 |
| 3. Products: flakes and blades | | | | | | | | |
| Semi-Levallois flakes | 1 | 4 | 1 | | 14 | 1 | 3 | 3 |
| Semi-Levallois blades | 3 | 2 | 2 | | 8 | | 4 | 11 |
| Non-Levallois points | | | | | 1 | 1 | 1 | 3 |
| Non-Levallois flakes | 5 | 31 | 22 | 20 | 106 | 11 | 20 | 74 |
| Non-Levallois flake-butts | 5 | | 26 | | 7 | | | 12 |
| Non-Levallois flake-fragments | 2 | 12 | 9 | 6 | 78 | 3 | 5 | 38 |
| Non-Levallois blades | | 5 | 7 | 1 | 13 | 1 | 16 | 29 |
| Non-Levallois blade-butts | 4 | | 4 | 4 | 3 | | 4 | 131 |
| Non-Levallois blade fragments | | 2 | 2 | 4 | 20 | | 6 | 54 |
| Preparation flakes etc. | | 2 | | 1 | 3 | 2 | 3 | 2 |
| Technical unit totals | 24 | 60 | 80 | 47 | 277 | 23 | 75 | 377 |
| Total | | | | | | | | 963 |

Table Z.2: Technological analysis of 963 pieces in six Beach Industry and two Amudian units from Abri Zumoffen.

| List of tools | Stratigraphic units | Beach Industry Units | | | | | | Amudian Units | |
|---|---|---|---|---|---|---|---|---|---|
| | | A, N-O | A, P-Q | A, R | B, Q-R & Cave | C4 | A, S-T | C3 | A19, X-Z |
| **Heavy-duty tools:** | | | | | | | | | |
| Chopper | | | | 1 | | | | | |
| Chopping-tool | | 1 | 1 | 1 | 4 | 1 | 6 | | |
| Rabot | | | 1 | | | | 1 | | |
| **Levallois tools:** | | | | | | | | | |
| Semi-Levallois flakes | | | 2 | 1 | | 1 | 14 | 2 | |
| Semi-Levallois blades | | | | 1 | | | 2 | 2 | 5 |
| **Mousterian tools:** | | | | | | | | | |
| Mousterian points | | | | | | | | | |
| Limace | | | | | | | | | |
| **Racloirs:** | | | | | | | | | |
| Single straight | | | 1 | | | | | 1 | |
| Single convex | | | | | | | | 1 | 2 |
| Single concave | | | | | | | | | 2 |
| Fragments of single racloirs | | | 1 | | | | 2 | | 2 |
| Double straight | | | | | | | | | |
| Double straight/convex | | | | | | | | | |
| Double straight/concave | | | | | | | | | |
| Biconvex | | | | | | | | | 1 |
| Biconcave | | | | | | | | | |
| Double concave/convex | | | | | | | | | |
| Fragments of double racloirs | | 2 | | | | | | | |
| Convergent straight | | | | | | | | | |
| Convergent convex | | | 1 | | | | | | |
| Convergent concave | | | | | | | | | |
| Offset | | | | | | | | | |
| Transverse straight | | | | | | | | | |
| Transverse convex | | | | | | | 1 | | |
| Transverse concave | | | | | | | | | |
| Inverse | | 1 | | | | | | | 1 |
| Abruptly retouched | | | | | | | | | |
| With thinned back | | | | | | | | | |
| With bifacial retouch | | | | | | | | | |
| With alternate retouch | | | | | | | | | |
| **End-scrapers:** | | | | | | | | | |
| Typical | | | 1 | | | | 1 | 1 | 1 |
| Atypical | | | | 1 | | 1 | 1 | | |
| **Burins:** | | | | | | | | | |
| Typical | | | | | | | 2 | 6 | 5 |
| Atypical | | | 1 | 1 | 1 | 1 | 2 | | 2 |
| **Perforators:** | | | | | | | | | |
| Typical | | | | | | | | | |
| Atypical | | | | | | | 1 | | 1 |
| **Backed knives:** | | | | | | | | | |
| Typical | | 2 | | | | | 2 | 6 | 10 |
| Atypical and fragments | | 1 | 2 | | | | 1 | 1 | 2 |
| Naturally-backed | | | 3 | 1 | | 1 | 4 | 2 | 4 |
| **Truncated pieces:** | | 1 | | | | | 1 | | |
| **Notches and Denticulates:** | | | | | | | | | |
| Clactonian notch | | | 1 | 1 | | | 1 | 2 | 1 |
| Retouched notch | | | | | | | 1 | | 1 |
| Denticulate | | | | | | | | | |
| Distally-notched | | | | | | | | | |
| **Retouched pieces:** | | | | | | | | | |
| Inverse retouch | | | | | | | 2 | | 1 |
| Abrupt, thin retouch | | | | | | | 1 | | 6 |
| Semi-abrupt, thin retouch | | | 3 | 1 | | | 1 | | |
| Total tools | | 8 | 18 | 9 | 5 | 5 | 47 | 24 | 47 |
| Unretouched flakes | | 7 | 25 | 45 | 15 | 9 | 96 | 20 | 60 |
| Unretouched blades | | 4 | 3 | 10 | 4 | 2 | 11 | 8 | 139 |
| Unretouched fragments | | 2 | 13 | 11 | 16 | 3 | 106 | 11 | 106 |
| Cores | | 3 | 1 | 5 | 1 | 3 | 14 | 5 | 20 |
| Débris | | | | | 6 | | 3 | 7 | 5 |
| Unit totals | | 24 | 60 | 80 | 47 | 23 | 277 | 75 | 377 |
| Total | | | | | | | | | 963 |

Table Z.3: Typological analysis of six Beach Industry and two Amudian units from Abri Zumoffen.

generally occur in the uppermost centimetres of the beach deposit, the knapping was probably done on the spot, before the beach had become cemented. One type of core predominates, the prismatic; all other types occur only sporadically if at all, especially in units with small samples. Cores are strangely rare in the Beach Industry units, even if the pieces here classed as chopping-tools were to be added; however, cores form 5.9% of Beach unit A, S-T, which has a good sample. This is not far from the figure of 5.1% cores in the best Amudian samples, A, 19 X-Z.

Following what has now become general practice, a number of pieces originally listed as core-scrapers and steep-scrapers are here reclassified as cores.

SUMMARY LEVALLOIS CORES (4): UNIPOLAR, 3 (2 Beach, 1 Amudian); BIPOLAR, 1 (Beach)

No classic radially-prepared Levallois cores were present in the units studied, but these four cores are unidirectionally-prepared in the Levallois manner. They are distinguished from prismatic cores by having a straight upper edge to the striking platform when this is seen in section, and by the fact that all subsequent removals occur on the same axis as the first, or with the core revolved only slightly off the axis of preparation. Two have faceted striking-platforms and one is made on a flake. One end of the bipolar core is somewhat prismatic.

PRISMATIC UNIPOLAR CORES (29): UNIPOLAR FOR FLAKES, 2 (Plates Z.2, no.2; Z.7, no.4); UNIPOLAR FOR BLADES/BLADELETS, 27 (Plates Z.2, no.4; Z.8, nos.7, 9; Z.9, nos.1, 7)

Since the prismatic cores from Amudian and Beach units are so similar, they are described <u>en bloc</u>. Some of the better specimens grade into summary Levallois types, resembling the 'Abu Halka' and 'Abu Sif point cores' of other workers, but the primary flaking-surfaces of most of the prismatic cores are not well-prepared. The products, which appear to have been blades of medium size (or, in the case of five small cores, small blades or bladelets) were evidently struck off the cores by the use of stone hammers. The striking-platforms are most often simply faceted (as in Plate Z.9, no.1), frequently plain (Plate Z.9, no.7), and only rarely finely faceted. A refreshed platform is shown in Plate Z.8, no.7

Three sub-types may be defined. Type 1 or Acheulean cores (10 specimens) tend to be large and globular, averaging 8cm. long (Plate Z.2, no.2); Type 2 cores (eight specimens) are smaller and may be called intermediate (Plate Z.2, no.4 and Z.9, no.1); Type 3 cores (eleven specimens) resemble those of the Upper Palaeolithic, and average 6cm. long. When much worked down, and with final removals aborted, Type 3 cores resemble chunky burins and may indeed (as in Bezez C) have been used as such. Jelinek (1975) reports a burin-like core from the Amudian layers of Tabun E which may equate with our Type 3. Some bipolar specimens were noted, not in the units studied, but in other Amudian layers and mixed areas.

Flint-knapping clearly took place on occupation floor A, 19 X-Z, judging by the unusually high number of both products and

cores of skewbald flint here. It also seems clear that the Amudian tools from the excavation were made on blade blanks struck from similar prismatic cores (compare the flake shown in Plate Z.7, no.2 with the core in Plate Z.2, no.4).

Two important points emerge from a study of the prismatic cores: first, we may note that the three types occur in both Beach and Amudian units, but in reversed proportions, Type 1 predominating in the Beach units and Type 3 in the Amudian units; secondly, the occurrence together of our Type 1 (Acheulean) and Type 3 (Upper Palaeolithic) prismatic cores reveals that the latter are no more than miniaturised versions of the former (compare the large core in Plate Z.2, no.2, which produced heavy Acheulean-like flake-blades, with the smaller versions already cited). The similarity of course partly derives from the fact that rounded pebbles are the raw material for both - large cobbles in the Acheulean and small pebbles in the Amudian. Indeed, these features convincingly explain the often-cited Upper Palaeolithic aspect of the Amudian (e.g. Garrod, 1956), as well as of the Pre-Aurignacian of Yabrud I, 15 (cf. Rust, 1950 and Bordes, 1955).

DISCOID CORES, 4 (Plates Z.2, no.1; Z.10, no.1; Fig.7, no.1 in the 1961 report)

These are distinguished from polyhedric cores by having one central ridge circling the thickest part of the piece, and a biconical or conical section; the striking platforms are unprepared. One specimen (Plate Z.10, no.2) had deeply aborted removals from one side of a central ridge and may have been a large tortoise core similar to that in Plate C.2, Bezez G50. Other pieces resemble the exhausted discs of Bezez C, with frilly and jagged ridges all round the periphery.

POLYHEDRIC AND DOUBLE ('BACK-TO-BACK') CORES, 7 (Plate Z.2, no.3)

Virtually all are of Nummulitic flint. The average size is a moderate 5.0 x 5.0 x 4cm. All but one have two distinct ridges, the exception having three ridges. One piece (C, 4) has two flaking-surfaces on crossed axes with different striking-platform types; three other crossed axis pieces occurred in A, 19, X-Z.

AMORPHOUS AND DIVERS CORES, 4 (Plate Z.10, no.3; see also Garrod and Kirkbride, 1961, Figs.5, 7)

Two of these are made on flakes, one intended to yield flakes and the other bladelets. One is unique - a polyhedron (Plate Z.10, no.3). Two pieces tend towards chopping-tools.

CORE FRAGMENTS, 9

Undeterminable as to type.

CORE DEBRIS, 10

These chunks of fractured flint show no indication of intentional faceting, and may be by-products of the non-Levallois form of débitage prevailing at Abri Zumoffen. (N.B. There are also some other nodules which are modified, but not as cores (for

example *rabots*); following the system used at Bezez, these are classified with the tools.)

## UNRETOUCHED FLAKES AND BLADES (305 pieces)

For the distribution of these within the various units, see the end of Table Z.3. The following types are present:

### 'LEVALLOIS-LIKE' OR SEMI-LEVALLOIS FLAKES AND BLADES

All these, like the following flake categories, were struck off by use of stone hammer. They have been pre-designed to some extent, having been struck from either summary Levallois or from partly prepared prismatic point- and blade-cores. It is questionable (see Copeland, 1981b) whether these should properly be called Levallois in the strict sense, particularly in the case of the blades; the term "semi-Levallois" seems not inappropriate to classify them. Similar pieces are found in the museum collections from Tabun Eb and Ea (see Garrod, 1956, Plate 3). At first Jelinek *et al.* (1973) found virtually no use of Levallois technique in the Amudian layers at Tabun, but after detailed study it was concluded that the technique was in fact present (Jelinek, 1981). The question of the classification of blades as either Levallois or non-Levallois has been studied by Jelinek (1975 and 1981) and recently reviewed by the present writer (Copeland, 1981b), following the discovery of a blade facies with some Amudian and some non-Amudian traits at Hummal in the El-Koum basin (Besançon *et al.*, 1981).

### NON-LEVALLOIS CORTEX FLAKES

These are the products of the first peeling of the cortex from the nodules; many have an upper surface consisting entirely of cortex; others have partial cortex surfaces, cortex on the tip, side etc. (Plates Z.5, nos.4 and 5 from the Beach Industry, and Z.8, nos.3 and 6 from the Amudian). Many cortex-backed blades, wedge-shaped in section, are present, and are more prevalent in Amudian units (Plates Z.9, no.4; Z.6, no.3; see also Table Z.4).

### PSEUDO-LEVALLOIS THINNING FLAKES (Plates Z.1, nos.2 and 7; Z.5, no.5)

These distinctive pieces occur in all units. They are markedly curved in profile and have small plain, lipped, linear or shattered butts. They appear to be thinning flakes struck off, following the initial removal of the cortex, during the reduction of large nodules into rough-outs for heavy-duty tools such as bifaces, picks, chopping-tools etc. They could quite well have been struck off the chopping-tools in Abri Zumoffen, or off pieces such as those comprising the massive element (e.g. the bifaces) at Bezez C, but their presence in Amudian units, where tools on nodules rarely occur, is not easy to explain. The Amudian units do contain globular and discoidal cores; they also contain 'crested flakes' with traces (such as substantial central ridges) which suggest the presence, at some stage, of cores larger than those now present in the assemblages (see Plate Z.7, no.6). Since it would seem that the small number of heavy-duty tools (small *rabots*, burins on worked

| Unit | Flakes with cortex | Flakes without cortex |
|---|---|---|
| A, S-T (Beach Industry) | 115 (11 tools) | 36 |
| A, P-Q (Beach Industry) | 13 | 7 |
| C4 (Beach Industry) | 7 | 4 |
| A19, X-Z (Amudian) | 16 (13 tools) | 21 (18 tools) |
| C3 (Amudian) | 29 | 13 |
| Total | 180 | 81 |

Table Z.4: Numbers of cortex flakes in three Beach Industry and two Amudian units. 261 observations (fragments, débris and problematic pieces not considered).

down cores) would not sufficiently account for the number of thinning-flakes or the presence of globular cores, it could be inferred that some heavy-duty objects were removed from the site after having been fashioned there.

It is worth commenting that the very thin, buttless types of biface-finishing flakes did not appear in the samples studied, perhaps because of the difficulties encountered in extracting them from the breccia, or alternatively because the artifacts were only roughed out on the site.

MISCELLANEOUS FLAKES

Some of these could have been produced as blanks for tool-making; in fact, some larger and heavier flakes were certainly made into rather rough Acheulean-like tools - cf. for example Plates Z.3, no.1 and Z.5, no.4. Others, more delicate, were converted into racloirs, denticulates, knives or raclettes (Plates Z.9, no.3; Z.9, no.6; Z.8, no.2).

BLADES AND PARALLEL-SIDED FLAKES

The proportions of flakes versus blades are generally reversed in Amudian and Beach units, forming one of the main differences between the two facies (see Tables Z.3 and Z.4). The large and small blades illustrated in Plate Z.5, nos.4 and 5 show the size range. There are two kinds of débitage among the blades - the clearly non-Levallois, wedge-shaped cortex blades, and the Levallois pieces struck from prepared cores (a similar bipartition is visible among the blades from museum collections of Tabun E material).

A large number of blades were broken in antiquity, the breaks being patinated and concreted. Some may have been (deliberately or not) snapped transversely, and have a chanfrein-like facet at the distal end. Other blades give a false impression of being broken, but the distal end in fact ends abruptly on a core-preparation facet, hinge fracture, or the bifacial traces of core ridges (the latter are plunging blades; Plate Z.6, no.3). The number of 'failed blades' is therefore rather high (an indication of inadequately-prepared cores, or of underdeveloped technical skill?). The broken blades occur most often as butt-sections or mid-sections, tips being rare in the sample studied. As can be seen from the blade removal scars on some cores, pointed tips could be produced; only two intact pointed pieces, out of the 855 artifacts studied survived; both were non-Levallois. Often only about 2cm. of the length remains on the butt section; one therefore cannot know how many of these might be the butts of the (now buttless) retouched tools, which are so frequently seen in the Amudian (e.g. Plate Z.9, nos.2 and 6).

NATURALLY-BACKED BLADES

The cortex-backed variety has already been described. This group consists of blades which have abrupt core-preparation facets down one lateral side so that it has no second cutting-edge. Especially common in the Amudian units (Plate Z.10, no.2), pieces

in this group often have a similar abrupt core-preparation facet at the distal end. Similar blades have been described from Tabun E by Jelinek et al. (1973) as 'thick prismatic blades, some of which approximate large burin spalls'.

PREPARATION AND REFRESHMENT FLAKES

These are rare. Only one burin-spall appeared in the units studied, perhaps because, though present, such small spalls would have been hard to extract from the breccia. The rare ridged flakes, e.g. no.6 in Plate Z.7, are seemingly struck from unprepared cores and are not true crested flakes.

FRAGMENTS

These are small fragments of flakes or blades without butt or bulb.

## OTHER TECHNICAL ATTRIBUTES OF THE FLAKES AND BLADES

MORPHOLOGY

Pieces with trapezoidal cross-section predominate; 'first flakes' do occur (Plates Z.1, no.4; Z.7, no.6), but almost all the blades have had at least a part of the central ridge removed before being struck off the core (Plate Z.7, nos.3 and 5), even if it is only a few millimetres (Plate Z.8, nos.6 and 8). This is also well illustrated in Fig.4 of the 1961 report, where, of the 17 pieces drawn, all but 3 have trapezoidal sections at the butt. The main part of the blade (from mid-section to tip) is, however, usually triangular in section. We have mentioned that pointed pieces are rare.

BUTT TYPES

Table Z.5 shows the overall distribution of butt types. In this table, pieces with faceted butt include both straight and convex types, straight ones predominating; however, a slight convexity in plan can be seen on many of the blades (cf. Plate Z.6, no.3). No chapeau-de-gendarme butts were seen. The faceting was mainly simple (Plate Z.7, no.5), the more finely-faceted butts appearing on blades (Plate Z.7, no.3); the facets often cross the butt obliquely. No clearly punctiform butts appeared; shattered butts were rare, but lipped and linear butts were frequent, particularly on thinning-flakes. Butts were not removed or thinned in the samples studied, except when a tool was made on the proximal end of the blank (Plates Z.3, no.3; Z.5, no.3).

The clear predominance (70%) of plain butts in the Beach units contrasts with the 41% plain butts in the Amudian units. Pieces without butts amounted to 37.7% of all blades in the Amudian and 42.5% in the Beach units. It should be noted that many other fragments classed as 'pieces with absent butts' may have originally been blades.

| Units | Non-Levallois flakes | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Plain butt | Faceted butt | Dihedral butt | Linear or lipped butt | Butt re-moved | Butt broken | Butt absent | Totals |
| <u>Beach Industry</u> | | | | | | | | |
| A, N-O | 4 | | 1 | | | 2 | 6 | 13 |
| A, P-Q | 27 | 3 | | | | | 13 | 43 |
| A, R | 27 | 1 | 1 | 4 | 1 | 1 | 12 | 47 |
| B, Q-R & cave | 12 | 2 | 1 | | | | 7 | 22 |
| C4 | 8 | | 1 | 1 | | 1 | 3 | 14 |
| A, S-T | 70 | 27 | 5 | 7 | 2 | 8 | 82 | 201 |
| <u>Amudian</u> | | | | | | | | |
| C3 | 13 | 1 | 1 | 1 | 3 | 4 | 6 | 29 |
| A19, X-Z | 36 | 28 | 4 | 3 | 4 | 5 | 44 | 124 |
| | Non-Levallois blades | | | | | | | |
| <u>Beach Industry</u> | | | | | | | | |
| A, N-O | 3 | | | | | 1 | | 4 |
| A, P-Q | 2 | | 1 | | | 1 | 3 | 7 |
| A, R | 9 | 1 | | | | 1 | 3 | 14 |
| B, Q-R & cave | 2 | | 1 | | | 1 | 4 | 8 |
| C4 | 1 | | | | | 1 | | 2 |
| A, S-T | 11 | 1 | 3 | 1 | 1 | 1 | 15 | 33 |
| <u>Amudian</u> | | | | | | | | |
| C3 | 11 | 5 | 2 | 3 | | | 6 | 27 |
| A19, X-Z | 16 | 16 | 8 | 5 | | 10 | 39 | 94 |

| Units | Levallois flakes | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Plain butt | Faceted butt | Dihedral butt | Linear or lipped butt | Butt re-moved | Butt broken | Butt absent | Totals |
| <u>Beach Industry</u> | | | | | | | | |
| A, N-O | 1 | | | | | | | 1 |
| A, P-Q | 2 | 2 | | | | | | 4 |
| A, R | 1 | | | | | | | 1 |
| B, Q-R & cave | | | | | | | | |
| C4 | 1 | | | | | | | 1 |
| A, S-T | 8 | 4 | | 2 | | | | 14 |
| <u>Amudian</u> | | | | | | | | |
| C3 | | 2 | 1 | | | | | 3 |
| A19, X-Z | 1 | 1 | | | | | 1 | 3 |
| | Levallois blades | | | | | | | |
| <u>Beach Industry</u> | | | | | | | | |
| A, N-O | 1 | 1 | | | | | 1 | 3 |
| A, P-Q | 1 | 1 | | | | | | 2 |
| A, R | 1 | 1 | | | | | | 2 |
| B, Q-R & cave | | | | | | | | |
| C4 | | 1 | | | | | | 1 |
| A, S-T | 1 | 4 | | 1 | | 1 | 1 | 8 |
| <u>Amudian</u> | | | | | | | | |
| C3 | 1 | 2 | | | | | | 3 |
| A19, X-Z | 4 | 4 | 1 | 1 | | | 1 | 11 |

Table Z.5: Analysis of the types of butt and morphology of flakes and blades from Abri Zumoffen.

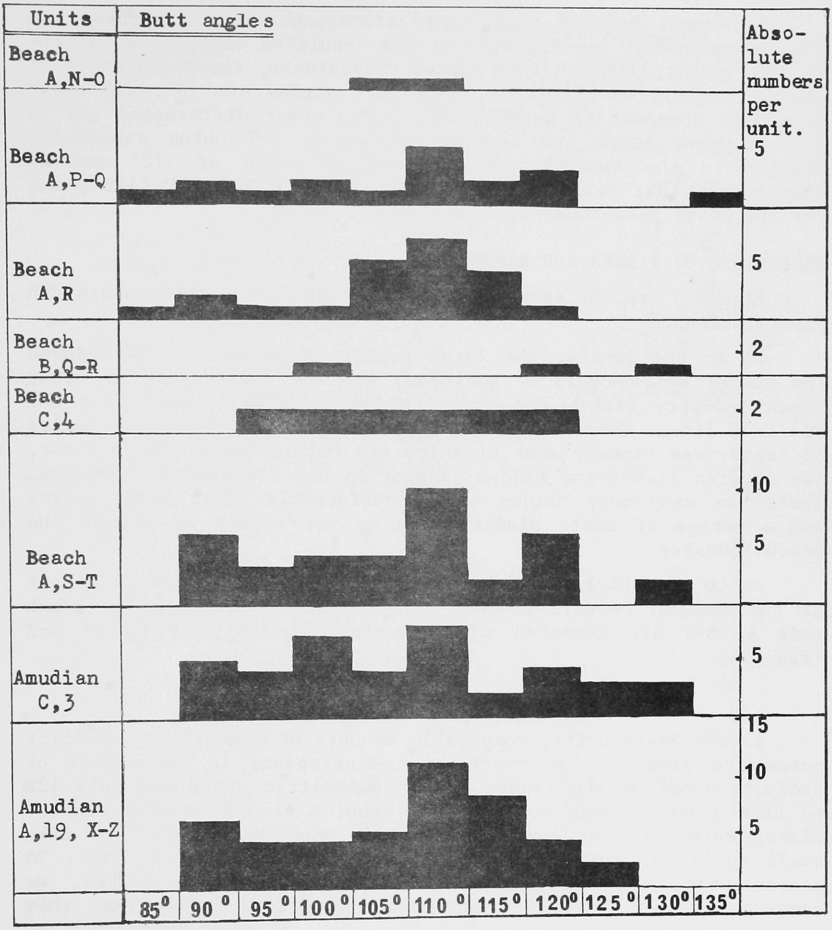



Fig.Z.2. Analysis of the butt-angles of flakes and blades in six Beach Industry units and two Amudian units. Absolute numbers are used rather than percentages in view of the small size of some samples. Each measurement is taken to the nearest 5° in the range shown, e.g. an actual reading of 117° would count as 115°, while 118° would count as 120°.

BUTT ANGLES

The angle between striking-platform and ventral surface was the one measured: see Fig.Z.2 for the resulting histograms for the various units. Although 110° angles predominate, there are hints of another population of pieces whose butt angles are 90°, and these seem more abundant in Amudian units. Few other differences can be seen between Beach and Amudian units, A, S-T being especially similar to the Amudian. The predominant angle of 110° may be compared to that for the Acheuleo-Yabrudian of Bezez C (120°) and for the Levalloiso-Mousterian of Bezez B (90°).

DIMENSIONS OF FLAKES AND BLADES

Figs.Z.3 to 5 show the length/width and thickness/width distributions.

As to the former, the large number of broken pieces reduced the number which could be measured, but the indications are that Beach Industry flakes and blades cluster mid-way between the L=W and L=2W lines. There is also a scattering of blades and a series of transverse flakes, some of which are fairly large. In contrast, the Amudian flakes and blades cluster on the flake/blade boundary. There are many more blades here, considerably fewer large pieces and a series of small blades which do not appear at all in the Beach Industry.

As to the thickness/width comparison, the miniaturised aspect of the Amudian is well brought out when the Th/W ratios of Beach unit A, S-T are compared to those for Amudian unit A, 19 X-Z (Fig.Z.5).

SUMMARY - FLAKES AND BLADES

In the Beach units, comparable amounts of Nummulitic and flint cores are present, but there is a discrepancy in the number of products - 88% of the flakes are in Nummulitic chert and only 12% in flint, even though the original pebbles are of broadly similar sizes. Moreover, the Nummulitic pieces were not knapped to make small tools, as most of the small tools present are of flint. To account for the presence of 'too many' Nummulitic flakes, we suggest something that is clearly beyond proof, namely that they were produced not in core reduction but in the manufacture of heavy-duty tools made on the site but subsequently removed (to Bezez?). This would also account for the low totals for cores (or core-tools) in some units.

In the Amudian units it appears that, during the occupational phases which succeeded the covering up of the beach deposits and the Beach Industry, emphasis was on the production and use of a series of tools on blades, and that Nummulitic cores were rarely, if ever, knapped. Since very similar blades are present in the Beach units, similar technical traditions seem to have been current in the Beach Industry phase, even if they were employed less frequently.

It should particularly be stressed that the blades in general do not really resemble Levantine Upper Palaeolithic blade forms. An

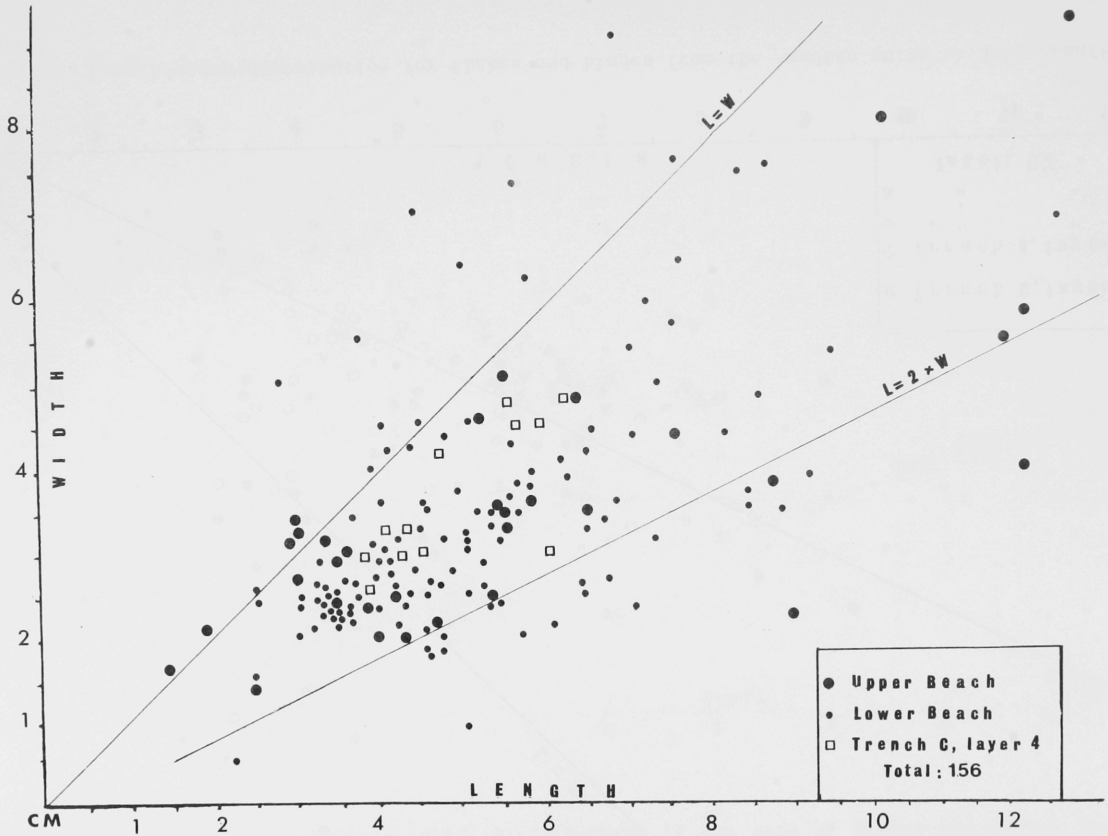



Fig.Z.3. Length/width distribution for Beach Industry flakes and blades at Abri Zumoffen.

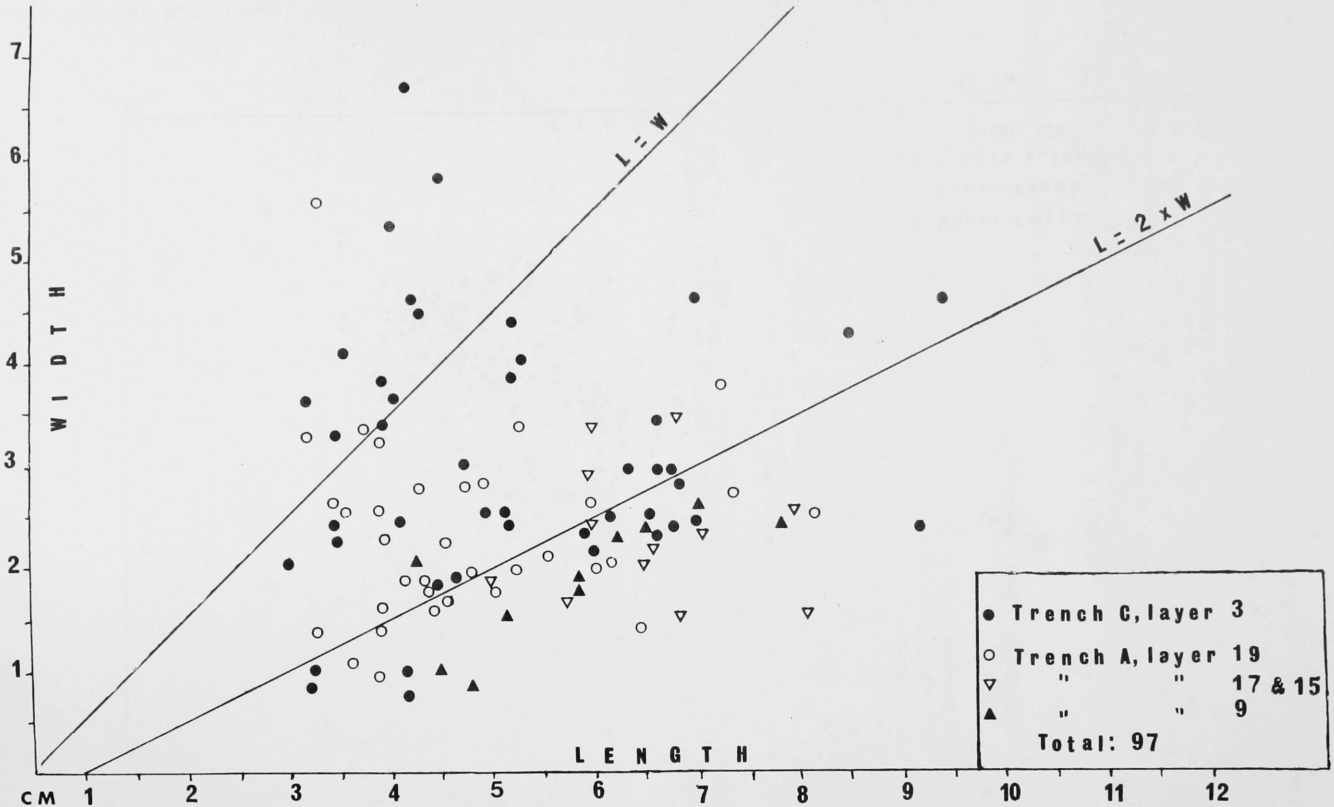



Fig.Z.4. Length/width distribution for flakes and blades from the Amudian units at Abri Zumoffen.

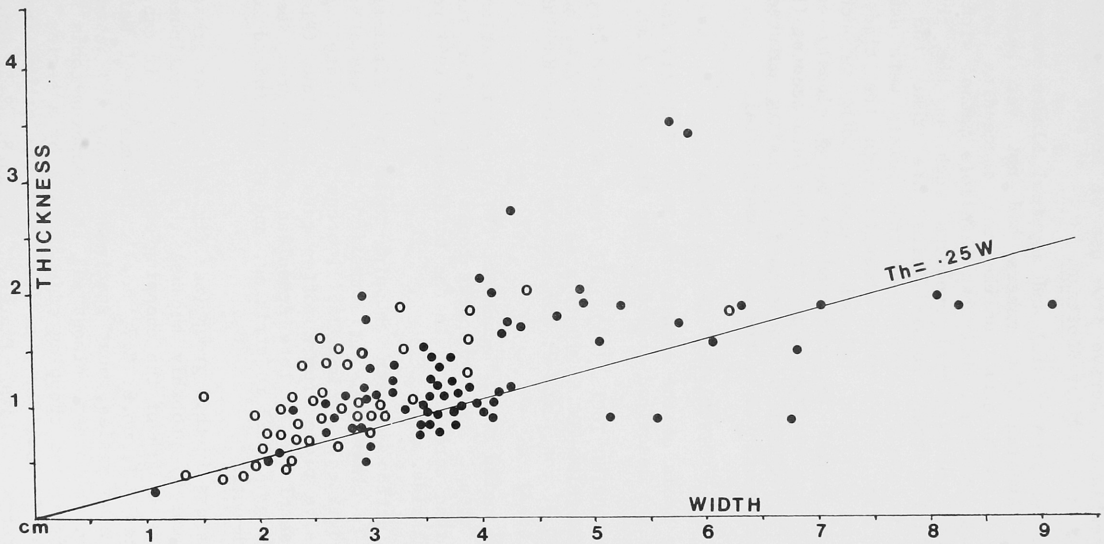



Fig.Z.5. Comparison of the thickness/width distributions of two sets of flakes and blades from Abri Zumoffen, from a Beach unit from Trench A, square S-T (filled circles) and an Amudian unit from Trench A, layer 19, square S-T (open circles). Note how the Amudian pieces cluster towards the narrow/thin range (left-hand corner).

exception could perhaps be made in the case of just a few of the more successful Amudian blades; these do somewhat resemble blade forms typical of the Emiran or first Lebanese Upper Palaeolithic phase at Ksar Akil, Abu Halka and Antelias (Copeland, 1970), which occurred c. 40,000 years later. It is however our view that such occasional resemblances derive from use of broadly similar core-types, which produce similar débitage.

The number of unsuccessful and atypical blades present could mean that the Amudian blade-makers had not yet perfected or stabilised their techniques (unlike the succeeding Levalloiso-Mousterians, who could use their own Levallois method with regular success to turn out standard products such as the triangular Levallois point). Other possibilities are that the Amudian population had no use for points, or that points were used until broken. These last ideas gain strength when the blade facies (consisting of elongated pointed pieces, both retouched and unretouched) of Hummal Ia, regarded as being closely connected chronologically with the Yabrudian, is taken into account (Besançon et al., 1981); knowledge of techniques for making pointed blades apparently already existed in the Last Interglacial.

## DESCRIPTION OF THE TOOLS

Since the tools of the Amudian and Beach Industry facies are so alike, they are described together (see also Table Z.3).

CHOPPERS AND CHOPPING TOOLS (14), all from Beach Industry units: CHOPPERS, 1; CHOPPING-TOOLS, 10 (Plates Z.1, no.8; Z.4, nos.1 and 2; Z.5, no.1; Z.6, nos.1 and 2; Z.7, no.7); DISCOID CHOPPING-TOOLS, 3 (Plate Z.3, no.3)

It will be noted that, because of the reclassification of the steep-scraper group, more chopping-tools appear for the units studied by us than were listed in the totals of the 1961 report by Garrod and Kirkbride.

The distinction between chopping-tools and first-stage or aborted cores is clearer at Abri Zumoffen than it was at Bezez in Level C, but equivocal specimens still occur (e.g. Plate Z.4, nos.1 and 2). A massive piece from Zumoffen cave is unique (Plate Z.6, no.1); its resemblance to Late Acheulean pieces from Ras Beirut collected by Bergy (1932) is striking, and it may indeed be a pick or biface rough-out.

The dimensions in this group (see Fig.Z.1) appear greater than those of the cores, probably because the cores continued to be worked down. The length of the chopping-edge varies; it can even be L shaped (Plates Z.1, no.8; Z.7, no.7). The number of main flake removal scars also varies, most specimens having 2-3 scars on one face and 3-4 on the other. Almost all the chopping-tools have one feature in common: the chopping edge is made by a series of blows on to one face, followed by a series on to the other, instead of the usual alternate blows (Plates Z.1, no.8; Z.5, no.1); the illustrated discoid specimen is also made in this way (Plate Z.3, no.3), but the rough specimen shown in Plate Z.4, no.1 is an exception. Another common feature is a finely-retouched area,

perhaps the result of omission of part of the chopping-edge (Plates Z.6, no.1; Z.7, no.7).

The prevailing edge-form is rounded in plan, pointed or straight edges being rare (Plates Z.1, no.8; Z.7, no.7). In section, the edge is not always markedly sinuous, except in the discoidal specimens and in rough pieces made on irregularly-shaped nodules instead of on the more usual rounded beach pebbles. (Note that the pieces shown in Plate Z.4 as nos.1 and 2 have been re-oriented from Fig.7, no.4 and Fig.6, no.2 of the 1961 report.)

Although none were present in the Amudian units we were able to study in detail, it may be mentioned that two chopping-tools occurred in Amudian layer 2 of Trench C, and there were two more in A, 17, squares T-U.

RABOTS, 2 (Plate Z.3, no.1)

Both are on heavy Nummulitic flint flakes; they measure 10.5 x 8.6 x 3.4cm and 9.8 x 5.9 x 3.5cm. respectively. The former is a kind of thick denticulate, and is peculiar in that the scraping-edge occurs on the proximal end. The second (illustrated) piece is made on a core-edge blade, and the edge is formed of steep, resolved facets; it could alternatively be called a heavy carinated end-scraper.

RACLOIRS (18): BEACH UNITS, 10 (Plate Z.5, no.2); AMUDIAN UNITS, 8 (Plate Z.9, nos.2-4)

Racloirs form a poor group in both facies. Beach Industry specimens are all in brown flint and all are made from mid-sections of blades. Very slight, flat scalar retouch is seen on one or both edges; often this hardly skims off the surface, but some pieces have a more Quina-like aspect, even if this derives from the natural thickness of the blank. The retouch on these is slightly stepped scalar, and semi-abrupt. On the pieces with flat scalar retouch, the facets are parallel, and placed obliquely on the edge. Only one piece (from A, N-O) is clearly a racloir of Yabrudian type, with the finely crushed edge noted in many Bezez C racloirs. An atypical piece (Plate Z.5, no.2) seems to be a biface thinning-flake made into an offset racloir. Some pieces have a slightly denticulated edge, perhaps the result of hard use.

The damaged condition of most racloirs in the Amudian units is illustrated by no.2 in Plate Z.9. All are of brown flint. The one intact piece has a slightly denticulated edge, formed by inverse, semi-abrupt, parallel and invasive retouch.

Four of the racloirs (all single convex) might be classed as 'atypical backed knives'; here the retouch is, however, not really abrupt. Three others have a somewhat denticulated edge, but the retouch is very flat. From Amudian layer 17 comes an Adlun burin opposed to a single convex racloir (Plate Z.9, no.5).

In the 1961 report the pieces shown in Garrod and Kirkbride's Fig.4, nos.8 and 9 would here be classed as racloirs, while nos.17 and 7 resemble our pieces with slightly denticulated edges, which are classed as 'denticulated racloirs' (e.g. Plate Z.9, no.6).

It appears that similar racloirs occur in Tabun E, described by Jelinek et al. (1973) as 'having much flatter retouch than is characteristic of the typical Yabrudian layers'. The minuscule 'skimming' retouch mentioned above is also present at Hummal Ia on many blades, where it grades into 'nibbled' retouch and into the more normal scalar retouch.

END-SCRAPERS (8): BEACH UNITS, 5 (Plates Z.3, no.2; Z.5, no.3; Z.7, no.1); AMUDIAN UNITS, 3 (Plate Z.10, no.2)

The end-scrapers lack a consistent pattern and are quite scarce. These traits match those of Bezez C end-scrapers. In no case were the retouch facets lamellar, as they usually are in Upper Paleolithic end-scrapers. In fact, all would be atypical in an Upper Palaeolithic context.

In the Beach units, in addition to the pieces drawn (see descriptions in captions) a nosed scraper and a denticulated end-scraper occurred. In the Amudian units, the end-scrapers are more distinctive, if the only three present are typical.

The low number of distal scrapers, when added to the similarly low number of side-scrapers, indicates that scraping activities were not extensively carried on at Abri Zumoffen in either Beach or Amudian phases. The contrast between this and the reverse situation in the Yabrudian layers is marked. A similar scarcity of end-scrapers has been noted at Hummal Ia, and by Jelinek at Tabun (op.cit.).

BURINS (220: BEACH UNITS, 8 (Figs.8 and 9 of 1961 report); AMUDIAN UNITS, 14 (Plates Z.8, no.1; Z.10, no.6; see also figs.8, no.8 and 5, no.1 of the 1961 report)

Burins form an important group in both facies and will be described in some detail. They are in general robust specimens, boldly made, with big facets which bite into the piece and which are almost always struck down the length. Often the negative scar of the burin spall impinges on the flake-surface, but it is most often opposed to a large transverse notch, or, in the case of dihedral types, occurs on a distal break or (rarely) on the butt. Double and multiple burins are common. Most burins are made on chunky flakes or blades, as are those in the Acheuleo-Yabrudian of Bezez C, but a few are on nodules. These were distinguished from worked-down cores on the basis of the acute angle between 'platform' and 'flaking-surface', and on other factors.

## THE BEACH INDUSTRY BURINS

Two of the eight pieces are made on nodules. Three are in brown flint and three in Nummulitic chert. The following categories are present:

a) a double burin on a truncation with two spall removal scars on the ventral surface (shown in the 1961 report, Fig.8, no.9);

b) a possible composite burin, being a straight dihedral on a flake fragment, possibly single blow, opposed to a lateral denticulate;

c) three typical dihedral burins, comprising an axial dihedral (or bec-de-flute) made on a large cortex flake measuring 12.3 x 6.4 x 3.7, perhaps better described as a proto-burin; a straight/oblique dihedral on a small nodule, with polyhedric burin edge similar to that in Plate Z.8, no.9; and a right-angle dihedral made on the butt of a cortex flake;

d) three atypical dihedral burins, one being a dihedral made on the butt of a desilicified flake, the other two being single blow dihedrals, each made on a distal break.
The dihedral burins are all rather poor or atypical. The sole truncation burin is not a true Adlun burin, as defined on p.23 of the 1961 report (see also the following paragraph).

THE BURINS OF THE AMUDIAN UNITS

All fourteen of these are in brown flint, two being on nodules. The following categories are present:

a) a multiple burin: a dihedral with two right-angle removal scars as well as a third burin edge in an older patina, on a truncation in the Adlun burin manner;

b) a possible transverse burin/racloir composite which has been badly burned;

c) four truncation burins, two being typical straight truncations, one of which is shown as plate Z.10, no.6 (and Fig.5, no.5 of the 1961 report); another specimen is made on a backed knife fragment;

c) four Adlun burins, one of which is atypical in that the truncation is made on the proximal end (it will be recalled that Adlun burins are defined as being made on a distal truncation in the form of a notch; Garrod and Kirkbride, 1961). In the three typical specimens, the spall removal scars are perpendicular to the ventral surface rather than plan; one is a composite, shown in plate Z.9, no.5, from layer A, 15; it has a denticulate or racloir on one edge;

d) three typical straight/oblique dihedral burins, and one offset dihedral burin;

e) one atypical dihedral - made on a flake butt by a single blow, the spall removal scar inclining on to the ventral surface.

SUMMARY - BURINS

Four traits recur in these distinctive tools:

1) the frequency with which the burin spall removal scars appear on the ventral surface;

2) the generally wide burin edge;

3) the wide dorsal scars on the blank, up to 1.5cm. long in the units studied, although the usual width is c.0.7cm.;

4) the occasional use of nodules, rather than flakes or blades, as blanks (unless, as mentioned, these specimens are really bladelet-cores).

Typical Adlun burins did not occur in the Beach Industry units studied. However, this tool-type was already in use in the Levant; a typical piece is present in the British Museum collections from Tabun Cave, coming from the Tayacian of Tabun G, the lowest level. True dihedral burins are present in both the Amudian and Beach Industry, if roughly made; the simpest forms predominate, i.e. single blow types, those made on a break and those made on the butt.

Most of the above-mentioned traits are present in the Pre-Aurignacian of Yabrud I, layer 15, and some in the burins of other Levant Lower Palaeolithic sites, e.g. the Late Acheulean of Oumm Qatafa (Neuville, 1952); they are also present in Hummal Ia.

ATYPICAL PERFORATORS OR BECS, 2 (one from the Beach Industry; one from the Amudian)

The single Beach Industry specimen may be an alternate bec burinant, if the inverse notch is not recent. The Amudian specimen is made on the butt of a flake and alternate retouch forms a sharp, thin point.

BACKED KNIVES (25)

TYPICAL: Beach Industry, 2; Amudian, 5 (Plates Z.9, no.8; Z.10, nos.5, 7; Fig.4, no.10 of the 1961 report); ATYPICAL: Beach Industry, 5 (Fig.8, no.4 of the 1961 report); Amudian, 13 (Plates Z.8, no.3; Z.9, no.9)

The backed knife group includes most of the "retouched blades" and "nibbled blades" of the 1961 report; the few exceptions are classed here as racloirs or denticulates.

This series sets the Amudian apart from the Pre-Aurignacian of Yabrud I, Level 15, to which in other respects it is comparable (Fig.Z.7). By definition this group consists of pieces assumed to be cutting-tools, each with a blunted area or finger-rest formed of abrupt lateral or distal/lateral retouch. It is a difficult group to sub-divide, since the amount of lateral blunting ranges from 'considerable' (when a lot of the blade's margin has been removed) to 'slight', i.e. barely perceptible (when only the extreme margin of the blade has been removed). Compare the piece shown as Plate Z.10, No.7 with that on Plate Z.9, no.8 (the former is not the thickest blunted back seen; a piece from B, L-Q had a back 1cm. thick). Typically, the back blunting is about as thick as the blunt edge of a modern pen-knife or dinner-knife, i.e. c. 1-2mm. thick at the point where the finger rests. As in many pen-knives, the distal end is slightly curved and has the thickest retouch; this has been called the San Remo type by H. de Lumley (1968). Some intact specimens resemble Audi or Chatelperron points (e.g. Plate Z.10, no.7). Two pieces have thin, sharp points which resemble the San Remo points so frequently seen in the Hummalian of Hummal Ia at El-Koum.

The retouch is invariably direct, is most often abrupt or slightly semi-abrupt; often, part of the back is abrupt, another part being semi-abrupt. The retouch facets are parallel, and irregular in the case of the nibbled pieces, or slightly step

scalar (in 2 ranks) on the thicker pieces. The back is most often regular and straight, but on some pieces it is very slightly denticulated or nibbled, and it is hard to define the line between these and denticulated racloirs, into which they grade.

Although those present are quite typical, backed knives are rare in Beach units. See Fig.4 of the 1961 report, nos.1, 2, 4, 6, 10, 11 and 13-15, which show specimens typical of the Amudian. Atypical backed knives usually have either an irregular back (12 cases), a partially cortex back, or a back of variable thickness. In those with part-cortex backs, retouch has in effect improved a naturally abrupt back (1961 report, Figs.4, 5, 7 and our Plate Z.8, no.4). One piece from A.9 is rolled; several others have two patinas or show signs of burning.

SUMMARY: BACKED KNIVES

The presence of so many broken and obviously utilised knives in the Amudian deposits surely indicates that some specialised activities involving cutting or slicing took place at Abri Zumoffen in this phase. The neatness, delicacy and small size of some pieces is to be noted; these contrast markedly with some of the heavier pieces with which they are clearly associated.

NATURALLY-BACKED KNIVES (15): Beach units, 9 (Plate Z.6, no.3); Amudian units, 6 (Plates Z.7, no.2; Z.8, no.4)

Only pieces showing signs of use on the cutting edge were admitted, although as Jelinek has noted, this practice may eliminate knives which had been used on soft materials. This group includes pieces with cortex back (10 cases; Plate Z.6, no.3) or with back formed by a core-preparation facet (5 cases; Plates Z.8, no.4; Z.7, no.2), the latter type being common in the Beach units. Two only are of Nummulitic chert. Note: Many other pieces had conveniently-placed cortex areas but were excluded since, to the naked eye at least, the cutting-edge seemed fresh and unused. As with the backed knives, a microwear analyst might reach a different conclusion.

The largest piece is shown on Fig.8, no.1 of the 1961 report and measures 12.1 x 4.5 x 1.7cm. The use-retouch on the cutting-edge is pronounced on six specimens.

TRUNCATIONS, 2 (Fig.4, no.3 of the 1961 report)

Both are from Beach units, one being a straight distal truncation, tending towards an end-scraper, and the other a fragment with a concave, finely retouched truncation and slight lateral nibbling.

NOTCHES AND DENTICULATES

NOTCHES: Beach units, 3 (Plate Z.5, no.4); DENTICULATES (2): Beach units, 1; Amudian units, 1

The low number of these has probably been affected by our exclusion of pieces with unpatinated notches; since some notches may have been the result of extracting the artifacts from the

breccia, it was felt wiser to count only pieces with clearly ancient notches. They are scarce, and not Clactonian-like. Although on a larger-than-usual blank, no.4 in Plate Z.5 has a typical notch. Three are lateral notches, one is distal and one is proximal.

Denticulates did not seem to form a type readily separable from other tools (e.g. the end-scraper in Plate Z.3, no.2 and the proximal retouch on a knife in Plate Z.9, no.9), especially from racloirs; as has been mentioned above, many of these had slightly denticulated edges and grade into 'thin denticulates'.

RETOUCHED PIECES (14): Beach units, 7; Amudian units, 7 (Plate Z.10, no.4)

These are slightly retouched pieces which do not fall into any of the above tool classes. The retouch is discontinuous; seven are fragments. Three (1 Beach, 2 Amudian) have inverse retouch; seven (1 Beach, 6 Amudian) have abrupt thin retouch, and four (Beach) have semi-abrupt thin retouch.

## THE TYPOLOGY OF FOUR ADDITIONAL AMUDIAN UNITS AND ONE OTHER OF UNCERTAIN ATTRIBUTION

### TRENCH C, LAYER 2

This is the uppermost, pink sandstone beach in Trench C; it was equated by the excavators with the beach of Trenches A and B on the basis of elevation above sea-level, but was considered by Sanlaville to be later. The implements appeared to have been deposited and incorporated while the sand was still loose. Alternatively, they were perhaps re-distributed from a still-loose layer 3 by the encroaching transgression, whichever one this was.

The following artifacts were recovered (total 113):

| Tools | Débitage |
|---|---|
| 3 chopping-tools | 2 prismatic blade- or bladelet-cores |
| 5 racloir fragments | 5 core fragments |
| 2 Adlun burin/backed knife composites | 49 unretouched flakes, butts and flake-fragments |
| 3 typical backed knives, one of 'Chatelperron' type | 24 unretouched blades, butts and blade-fragments |
| 4 fragments of nibbled blades | 1 burin spall |
| 7 atypical backed knives | |
| 2 naturally-backed knives | |
| 1 denticulate | |
| 5 retouched or utilised pieces | |
| 32 | 81 |

### TRENCH C, LAYER 1

This is a brecciated soil layer covering the beach of layer 2. It may have been deposited during or after Enfean IIB. The 'nick' in its profile is suggestive of a later truncation, perhaps during the Naamean transgression; this would be more probable if the 'marine organisms' spotted by Zeuner (Zeuner *et al.*, 1961) on the lip of layer 1 were *Vermettus*.

The following artifacts were recovered (total 144):

Tools

2 single straight *racloir* fragments
1 single convex *racloir*
1 single concave *racloir*
1 burin/nibbled blade composite
4 burins, category not recorded
1 atypical perforator or distally-notched piece
1 backed knife with indirect retouch
7 backed knife fragments
4 notched pieces - thin
1 notched piece - thick
4 denticulates
5 retouched or utilised pieces
32

Débitage

6 prismatic unipolar cores
3 prismatic bladelet-cores of 'Upper Palaeolithic' type
1 prismatic bipolar core
1 discoid core with discontinuous ridges
5 core fragments
50 unretouched flakes and fragments
46 unretouched blades and fragments
112

TRENCH A, LAYER 17, SQUARES S-U

This is an occupation horizon separated by a calcrete band from the underlying layer 19, already described. Using the markings, the following pieces were extracted from a group published as Layers 11-17, S-V on p.33 of the 1961 report (total 134):

Tools

3 semi-Levallois blades
2 chopping-tools
1 denticulated *racloir*
2 Adlun burins
2 typical backed knives on big blades
3 typical nibbled backed knives
9 naturally-backed knives (five on blades with wedge-shaped section)
3 pieces with thin retouch
25

Débitage

6 prismatic unipolar cores
1 prismatic bipolar core
1 pyramidal point-core of pyramidal aspect
1 double back-to-back core
100 (approx.) unretouched flakes, blades, butts, fragments
109

TRENCH A, LAYER 15, SQUARES X-Z

This was another occupation horizon, overlying layer 17 and separated from it by a calcrete band. Ten intact pieces were measured, consisting of: 1 *racloir* on a blade, 1 denticulate *racloir*, 3 typical backed knives, 2 atypical backed knives or *raclettes*, 2 notched blade fragments, 1 summary Levallois point-core of 'Abu Sif' type. The rest of the material from this layer is published on p.35 of the 1961 report, consisting of 33 retouched blades, 3 burins, a chisel and a retouched fragment.

The foregoing data from Trench C layers 1 and 2 and from Trench A, layers 15 and 17 tend to confirm the overall consistency of the Amudian industry at Abri Zumoffen. This may be compared to a more equivocal layer, Layer 9, a 40cm. thick deposit in Trench A.

## TRENCH A, LAYER 9

According to the 1961 report (p.15) the calcrete floor separating the layers had petered out, leaving the deposit with an homogeneous appearance both in Trench A and in the equivocal layer 4 of Trench B. Amudian tool-types appeared to be more common at the base of the layer, and a Yabrudian element more noticeable at the top. The excavators had the impression that the layer as a whole represented a development upwards but, since there was no sign of a typological break in mid-layer, all the artifacts were given the same mark.

The following racloirs were obtained from this horizon, squares W-X: 1 single straight; 4 single convex; 1 double straight/convex on a tabular nodule, without bifacial retouch; 1 convergent straight/convex, on a flat cortex flake; 1 convergent biconvex, massive, both edges having Quina retouch (it measures 10.5 x 6.8 x 4.2cm., and would pass for a Heavy Neolithic scraper (see below); finally, one acute-angled offset racloir of Winkelkratzer type on a thin, buttless flake.

Also present were a chopping-tool, a large backed knife with partially bifacial retouch on the cutting-edge and deep, abruptly retouched back. The steep-scrapers listed in the 1961 report are re-classified here as prismatic blade-cores.

It is clear from the racloir list that Layer 9 is not pure Amudian, or at least that it does not resemble the Amudian layers we have discussed; the racloirs probably came from the top of the layer. Although the excavators felt that Layer 9 as a whole should be attributed to the Amudian, this writer prefers to set it apart for the time being.

## THE YABRUDIAN LAYERS

### YABRUDIAN LAYERS 7 - 3

These were not fully studied by the present writer, and the reader is referred to the 1961 report pp.26-28, and to the illustrations in its Figs.1-3, which clearly show the different character of the Yabrudian levels which overlie the Amudian. In them, the racloirs are numerous, many being of distinctive Quina type. Nevertheless, Amudian traits persist; beside the abundant racloirs there are backed knives, blades and blade-cores. Bifaces are rare - only two were found (in Layer 3 of Trench B).

## TERRA FUSCA AND SURFACE SOIL: LAYERS 2 AND 1

As mentioned in Chapter 3, Section II, the Yabrudian layers were overlain by a weathering zone of terra fusca soil (layer 2) which was subdivided laterally into 2a, 2b etc. In squares N-R this horizon was considered by the excavators to be mixed, due to the weathering out and merging of the individual layers; therefore they did not publish the inventories for these squares. However, the material of one square, Q, appears to be of a different character, as does the deposit which contains it.

TRENCH A, LAYER 2c (?), SQUARE Q

This unit overlay Beach unit A, P-Q and was contained in a dense grey breccia likened by Zeuner et al. (1961, p.65) to that of layer 9, instead of in a weathered zone. It underlay the weathered soil of the rest of layer 2, which produced scanty Yabrudian artifacts. Since these included a small biface, the excavators provisionally classed the assemblage as 'possibly Yabrudian', but, judging by what appears to be the prevailing stratigraphic pattern at Abri Zumoffen, it ought to be Amudian. The layer contained 88 artifacts:

1 small biface, 5.7 x 4.4 x 1.7cm., of grey tabular flint (1961 report, Fig.2, no.6)
2 chopping-tools
2 single convex racloirs, one being a denticulate, on a large pointed blade
2 racloir fragments
1 end-scraper
1 Adlun burin
1 atypical perforator - possibly an end-scraper composite
7 backed knives, with nibbled retouch (1961 report, Fig.3, no.9)
3 naturally-backed knives
3 notched pieces
1 retouched piece
59 unretouched pieces (36 flakes, 22 blades, 1 crested flake; four are Levallois)
4 prismatic blade- or bladelet-cores
1 core fragment

Except for the small biface, this unit would fit very well with the Amudian and does not resemble the Yabrudian material in layers 7-3. It does not seem to belong to Layer 9 either. As to the biface, a few were present in Tabun's Amudian layers according to Jelinek (pers.comm., 1973) and 'débris de bifaces' was present, according to Bordes (1955), at Yabrud I, layer 15. However, with a sample of only 24 tools plus waste, we cannot say more than that this unit is probably Amudian (especially since it occurs in a breccia) rather than of the layer 2 Yabrudian facies in the terra fusca.

This unit and Layer 9 - each in a different way - point up the fact that distinction between 'Amudian' and 'Yabrudian' is not always clear-cut at Abri Zumoffen, and this will be discussed further later.

## STATISTICAL ANALYSES

Given the small samples, these were confined to the simplest kind.

### INDICES

Table Z.6 shows the technological indices of the units which had sufficient artifacts to form a good sample. The two Upper Beach units, N-O and P-Q, have been amalgamated into one (N-Q), but two widely-separated units which cannot be amalgamated (C, 4 and B, Q-R) have been omitted.

| Column number | 1 | | | 2 | | | 3 | | | 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Index | Levallois (IL) | | | Faceted Butt (IFl) | | | Blade (ILam) | | | Nummulitic flint index | | |
| Layers and totals | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % |
| Upper Beach (84): Trench A, N-O and P-Q | 10 | 77 | 13.0 | 9 | 41 | 22.0 | 16 | 77 | 20.8 | 52 | 84 | 61.9 |
| Lower Beach (277): Trench A, S-T | 22 | 256 | 8.6 | 48 | 256 | 18.7 | 41 | 256 | 16.0 | 199 | 277 | 71.8 |
| Amudian, shelter area: Trench A19, X-Z (277)* | 14 | 232 | 6.0 | 62 | 232 | 26.7 | 105 | 232 | 45.2 | 4 | 277* | 1.4 |
| Amudian, terrace area: Layer 3, Trench C (75) | 7 | 62 | 11.3 | 14 | 62 | 22.6 | 30 | 62 | 48.4 | 10 | 75 | 13.3 |
| Column number | 5 | | | 6 | | | 7 | | | 8 | | |
| Index | Essential IR & II | | | Essential III | | | Essential IAu | | | Essential IHD | | |
| Layers and totals | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % | no. | no. in class | % |
| Upper Beach (26): Trench A, N-O and P-Q | 6 | 21 | 28.6 | 7 | 21 | 33.3 | 5 | 21 | 23.8 | 3 | 21 | 14.3 |
| Lower Beach (47): Trench A, S-T | 3 | 27 | 11.1 | 10 | 27 | 37.0 | 3 | 27 | 11.1 | 7 | 27 | 25.9 |
| Amudian, shelter area: Trench A19, X-Z (47) | 8 | 35 | 22.9 | 21 | 35 | 60.0 | 12 | 35 | 34.3 | - | | |
| Amudian, terrace area: Layer 3, Trench C (24) | 2 | 20 | 10.0 | 14 | 20 | 70.0 | 7 | 20 | 35.0 | - | | |

Table Z.6: In columns 1-4, technical indices of two Beach Industry and two Amudian units; in columns 5-6, the typological indices. Column 1 concerns pieces partly or entirely prefashioned on one-axis cores. The typological indices must be regarded as somewhat distorted, as they are based on small samples. IHD is the index of heavy-duty tools (column 8). * - 106 fragments and débris excluded.

It can be seen that technically there is little to differentiate the Beach Industry from the Amudian, with the exception of the flake/blade ratio. Amongst the Beach units, square R differs somewhat in having far fewer faceted butts, and N-Q has a slightly higher IL than the others.

Typologically, the scarcity of essential tools makes for difficulties but, so far as the statistics can be trusted, the greatest differences between the Beach Industry and the Amudian lie in the absence of heavy elements in the Amudian, and the presence in it of more blades. The Upper Palaeolithic index is high in all the units, but the figures are higher in the Amudian. Otherwise, the indices show random variation and do not differentiate one facies from the other. Thus, if we consider the two best samples, one from each: A, S-T and A, 19 X-Z have comparable racloir and burin indices; they have comparable Upper Palaeolithic indices; the Amudian unit has more backed knives. (It should also be recalled that some of the Amudian layers had rare chopping-tools, reducing still further the possible differences.)

CUMULATIVE GRAPHS

The tools in Table Z.3 were re-arranged into the order of the Bordes method (1953) as shown in Table Z.7 (fragments of single racloirs were classed as single convex, double racloir fragments as double convex straight). In spite of low totals for individual units, strikingly similar graphs resulted. They were therefore amalgamated, as shown in Fig.Z.6. The chopping-tools in the Beach Industry gives it a curve closer to the diagonal than are those of the Amudian units, since the percentages of all other tools are lowered; nevertheless the overall similarity between the two facies remains readily apparent.

In Fig.Z.7, an Amudian curve is compared to that prepared for the Amudian of Tabun Bed 48B (Jelinek, 1975) and to that for the Pre-Aurignacian of Yabrud I, layer 15 (Bordes, 1955, Fig.6). It can be seen that the higher racloir and burin counts and the very low blade count set the Pre-Aurignacian apart from the two Amudian assemblages. The latter are very similar, yet both differ considerably from curves plotted for Acheulean, Yabrudian or Mousterian industries (see Bordes' graphs, op.cit. and our Figs.C.19, a-d and B.9-11).

## INTER-UNIT COMPARISONS

Relationships between the Upper and Lower Beaches in Trenches A and B, as well as those between the Trench C layers and the other units, and those between Beach and Amudian units, were studied; see the altimetric correlations in Fig.S.14, on p.85 above.

As regards the Upper and Lower Beaches, the artifacts differ little from those of the intermediate squares A, R and B, Q-R - indeed, the typological evidence does not offer us any grounds for assigning the latter specifically to one or the other. As mentioned earlier, the hypothesis that they are one and the same facies is strengthened by the opinion of Sanlaville (based on the altimetric data at Adlun and that of Enfean beaches in the vicinity) which is

| Bordes' number and type | Beach Trenches A, B & C4 No. | % | Amudian Trench C, 3, 2 & 1 No. | % | Amudian Trench A, 19 & 17 No. | % |
|---|---|---|---|---|---|---|
| 4. Retouched Levallois point (including elongated) | | | | | | |
| 5. Pseudo-Levallois point | | | | | | |
| 6. Mousterian point | | | | | | |
| 7. Elongated Mousterian point | | | | | | |
| 8. Limace | | | | | | |
| 9. Racloir: single straight | 2 | 2.9 | 7 | 8.4 | | |
| 10. single convex | 2 | 2.9 | 2 | 2.4 | 7 | 9.6 |
| 11. single concave | | | 1 | 1.2 | 2 | 2.7 |
| 12-17. double | 2 | 2.9 | 1 | 1.2 | 1 | 1.4 |
| 18-20. convergent | 1 | 1.5 | | | | |
| 22-24. transverse | 2 | 2.9 | | | 1 | 1.4 |
| 30. Typical end-scraper | 2 | 2.9 | 1 | 1.2 | 1 | 1.4 |
| 31. Atypical end-craper | 3 | 4.4 | | | | |
| 32. Typical burin | 2 | 2.9 | 13 | 15.7 | 7 | 9.6 |
| 33. Atypical burin | 6 | 8.8 | | | 2 | 2.7 |
| 34. Typical borer | | | | | 1 | 1.4 |
| 35. Atypical borer | 1 | 1.5 | 1 | 1.2 | | |
| 36. Backed knife | 4 | 5.9 | 20 | 24.1 | 18 | 24.7 |
| 37. Atypical backed knife | 4 | 5.9 | 8 | 9.6 | 4 | 5.5 |
| 38. Naturally-backed knife | 9 | 13.2 | 4 | 4.8 | 13 | 17.8 |
| 39. Raclette | | | | | | |
| 40. Truncated piece | 2 | 2.9 | | | | |
| 41. Mousterian tranchet | | | | | | |
| 42. Notched piece | 3 | 4.4 | 7 | 8.4 | 3 | 4.1 |
| 43. Denticulate | 1 | 1.5 | 5 | 6.0 | 1 | 1.4 |
| 44. Bec burinant alterne | | | | | | |
| 45. Inversely retouched piece | | | | | | |
| 46. Abruptly retouched piece | | | | | | |
| 47-50. Abrupt/alternate thick/thin retouch | | | | | | |
| 51. Tayac point | | | | | | |
| 52-53. Notched triangle, pseudo-microburin | | | | | | |
| 54. Distally-notched piece | | | | | | |
| 55. Cleaver | | | | | | |
| 56. Rabot | 2 | 2.9 | | | | |
| 57-58. Tanged piece | | | | | | |
| 59. Chopper | 1 | 1.5 | | | | |
| 60-61. Inverse chopper, chopping-tool | 14 | 20.6 | 3 | 3.6 | 2 | 2.7 |
| 62. Divers (polyhedron, disc, pounder) | 5 | 7.4 | 10 | 12.1 | 10 | 13.7 |
| Totals | 68 | 99.8 | 83 | 99.9 | 73 | 100.1 |

Table Z.7: Abri Zumoffen: Essential tool percentages, in the order used by F. Bordes (1961) in cumulative graphs.

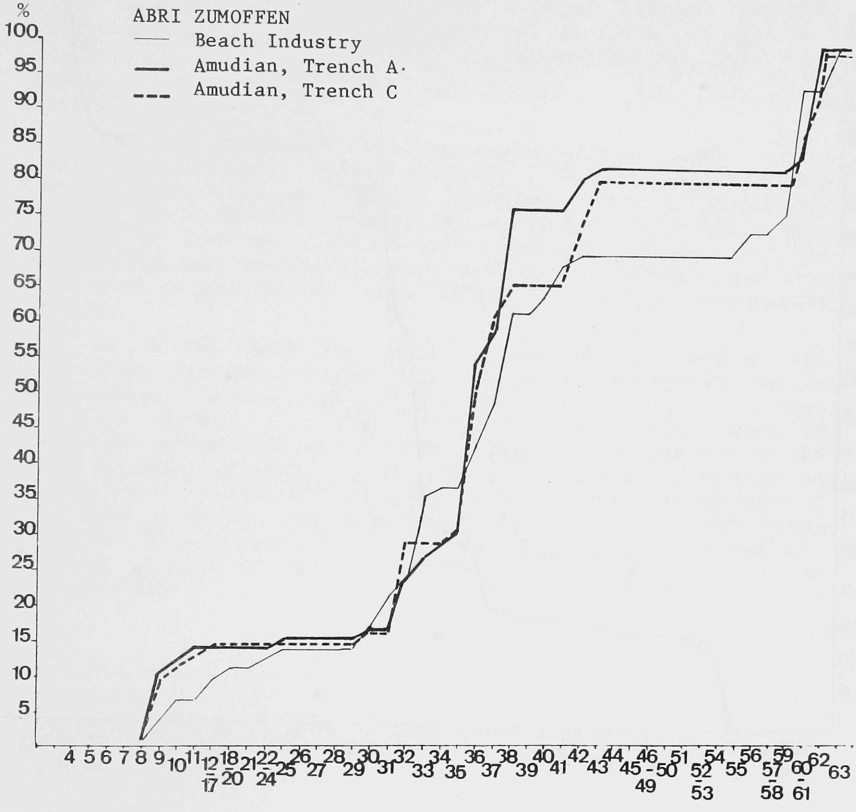



Fig.Z.6. Cumulative frequency graphs comparing the essential percentages of tool-types in the Beach Industry and two Amudian units (see Table Z.7 for figures).

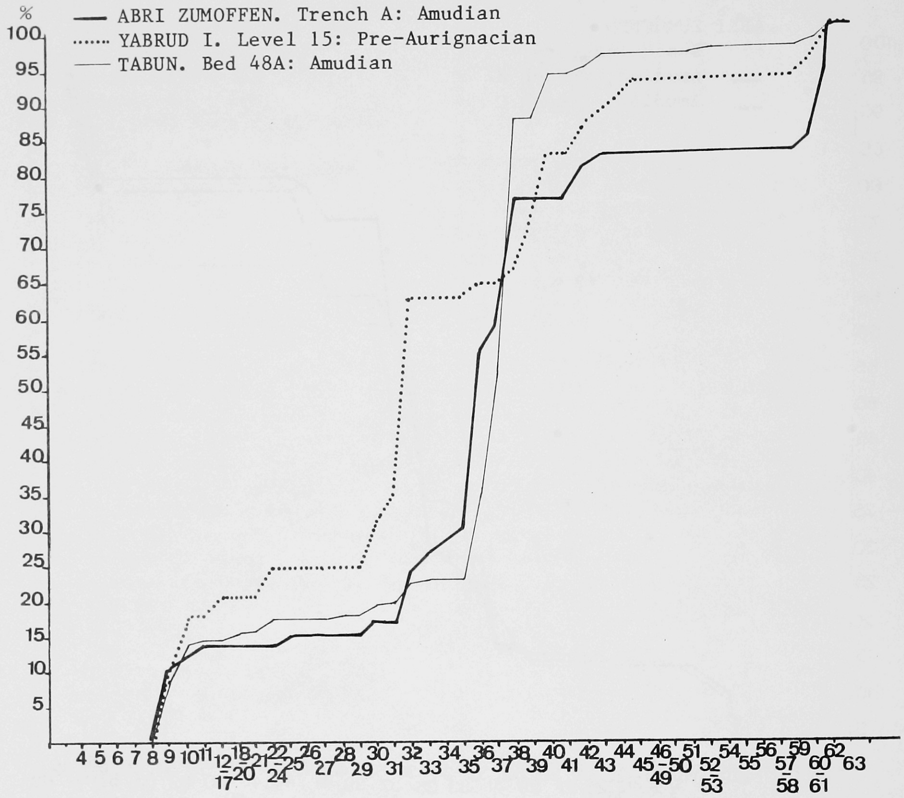



Fig.Z.7. Cumulative frequency graphs showing essential percentages of tool-types in the Amudian of Abri Zumoffen compared to the Pre-Aurignacian of Yabrud I, 15 (after the method of Bordes, 1953), and to the Amudian of Tabun (after Jelinek, 1975).

that the Upper and Lower beaches are one and the same formation (pers.comm. 1973; 1977).

The Trench C material differs from that of the other assemblages in certain respects: it will be recalled that the trench itself is located on the open terrace outside the sheltered area of cave and rockshelter; on geological grounds, its lowest layer of beach deposit is older than that in Trenches A and B while, from the topographical point of view, one might expect that tasks were carried out here which differed from those done in the shelter proper, and that this would be reflected in the kinds of artifacts found.

The excavators described the assemblages in layers 3-1 as 'Amudian with Beach Industry elements'. The fact that the same shiny grey flint was used in both the Beach and Amudian phases seem to blur the differences between the two facies, which was so much clearer in Trenches A and B. All this tends to bear out the possibility that Trench C layer 4 represents an earlier phase than that seen in the shelter, while layers 3-1 could be contemporary with it.

As to the Beach and Amudian Industries at Zumoffen, the conclusion reached is that they are partly successive, partly contemporary manifestations of what must be the same (or a very similar) facies, such distinctions as occur being based on different proportions of the same types. This conclusion is the same as that reached by the excavators. But while the Amudian and Beach Industries at Abri Zumoffen can be regarded as variants of the same industry, the material in layers 7-2 is sufficiently distinct typologically to warrant the general label 'Yabrudian', bearing in mind that it is a Yabrudian facies much influenced by the Amudian.

## LOCAL COMPARISONS

The site nearest to Abri Zumoffen is, of course, Bezez Cave. Since Bezez C contained exactly the kind of artifacts which we have suggested are missing from the Beach Industry, that is, large cores (or core tools) of Nummulitic flint, some possibly only roughed out, the question of the contemporaneity of Bezez C and the Abri Zumoffen Beach Industry arises. If the Bezez C occupation directly followed the Enfean II beaches, it would indeed be contemporary with the Beach Industry at the start; if, however, Bezez C occurred after the Enfean Ib retreat from the 20m. level, it would slightly precede the Beach Industry, as set out on Table R.1. In any case Bezez C could have lasted throughout the Abri Zumoffen phases, and if this were so it could have represented the main habitation site, with the smaller shelter and surrounding terrace forming an annexe in which special tasks were carried out. These tasks could have been flint-knapping represented by the Beach Industry phases, and cutting or slicing operations and use of fires in the case of the Amudian phases - or perhaps both, in the Trench C area. There are hints in the alternating thin band of sterile calcrete and occupation deposit in the Amudian layers that these activities were carried out at somewhat regularly spaced intervals, perhaps seasonally.

However, up to now, the generally-held view has been that the Abri Zumoffen occupations succeeded those of Bezez C. Certainly, at first glance the Zumoffen industries involved (Beach Industry and Amudian) appear to be completely different from what we see in Bezez C. Although the non-Levallois techniques of flint-knapping, using prismatic and discoid cores, were the same, at Bezez they are directed towards the production of heavy flakes, while at Abri Zumoffen the emphasis was on producing small blade blanks from small, sometimes miniature, cores. The proportions of tool-types are also markedly different. However, as the study of Bezez C showed, examples of each typical Amudian tool known at Abri Zumoffen could be found in Bezez C, even if some, e.g. backed knives, were rare. Similarly, Amudian tools occurred in the Yabrudian layers 7-2, somewhat more frequently. In contrast, many typically Yabrudian racloir forms (especially Quina transverse and offset types), as well as bifaces, are virtually absent from the Amudian. It is in fact possible to suggest that the Yabrudian, sensu lato, could be regarded as the parent industry, and the Amudian as a specialised variant of it, a concentration of small tools made to enable some particular activities to be carried out. Jelinek came to much the same conclusion when faced with a number of thick racloirs and even bifaces in one Amudian lens at Tabun (Bed 48B, now bed 75I in unit XI; Jelinek, 1975; 1981). Yet another variant seems to be present at Adlun in the 'Yabrudian with blades', containing only 2-4% bifaces, of layers 7-3. In layer 2 occurred a 'Yabrudian with bifaces' which seems comparable to the Acheuleo-Yabrudian of Bezez C, perhaps signifying a return to use of heavy tools at Zumoffen itself at the end of the phase. This development is broadly duplicated at Tabun in Ea. In short, we may say that the possibility that Bezez C and Abri Zumoffen were contemporary is certainly not ruled out on typological grounds.

It is a pity that the faunal evidence (see Chapter 7) is so sparse, as some hint as to the reasons for the industrial fluctuations at Abri Zumoffen might have emerged had the sample been larger; we can only suggest that those who made the Yabrudian industries were killing equids more often than were those who made the Amudian.

## REGIONAL COMPARISONS

In the Levant, only Tabun E and Yabrud I, layer 15 have produced material comparable to the Amudian: indeed, for more than 30 years they were the only known occurrences. The affinities of the blade facies incorporated in Tabun Ea and Eb with that found in Abri Zumoffen became clear when the latter was excavated, and prompted Garrod and Kirkbride to re-name it Amudian (1961, p.11), dropping the label 'Pre-Aurignacian' which the former had used following publication of Rust's Yabrud I Layer 15 material in 1950. The name Amudian is actually taken from the Zuttiyeh Cave in Wady-el-Amud, Galilee, Israel, where Turville-Petre had noted blades in what proved to be a Yabrudian industry, as long ago as 1925-6, though they were never properly studied as a group. Recently, more Amudian material from Tabun has been found in various lenses of Tabun E by Jelinek (1975). His preliminary observations confirm the similarity of the Abri Zumoffen and Tabun Amudian in several

respects, including their probable relationship with the enveloping Yabrudian; of the latter and the Amudian in Bed 48B he suggests that 'a single basic technology may characterise both' (1975, p.310). Although Bed 48B contains some bifaces and heavy *racloirs*, another Amudian layer now being studied is said to be more 'pure' (A. Jelinek, pers.comm., 1974) and it is clear that we must await completion of the Tabun studies before drawing firm conclusions.

Turning to Yabrud, the blade facies of Shelter I layers 15 and 13 occurs, just as at Tabun, sandwiched between reasonably typical Yabrudian layers. However, as the analyses above (e.g. that in Fig.Z.7) showed, layers 15 and 13 contained a burin-dominated facies with more end-scrapers, *racloirs* and denticulates than in the Amudian, while the latter is dominated by backed knives and has some semi-Levallois pieces and rare chopping-tools. Nevertheless, some of the similarities are striking: predominance of blades, blade-tools and Upper Palaeolithic types; no (or almost no) bifaces; no Quina *racloirs* and indeed few *racloirs* of any sort; the 'Upper Palaeolithic Index' of layer 15 is given by Bordes as 45% (1955, p.507), very close to that for C3 at Zumoffen of 47.5%.

All these blade facies occur in a late Acheulean/Early Middle Palaeolithic context, certainly contemporary with industries containing bifaces: they are sandwiched *between* the latter in two cases (Yabrud and Tabun) and occur *under* them at Abri Zumoffen.

As mentioned above on p.218, sites containing blade facies contemporary with the Yabrudian have recently been joined by the curious assemblage from Hummal Ia in Syria. This occurs at an elevation at the site similar to that of the Yabrudian layer, Ib. Technically, the blade industry of Hummal Ia includes some very long and some small specimens, struck from unipolar or bipolar one-axis cores. Some appear to have been prepared by Levallois methods, others seem to be 'series blades' (Tixier, Inizan and Roche, 1980), i.e. struck off in succession from alternate ends of the core without individual preparation (Copeland, 1981b). Typologically the industry is unlike either the Amudian or the Pre-Aurignacian because the list of tools includes elongated Mousterian points, *racloirs* on blades as well as many blades pointed by bilateral retouch ('Hummalian points'). On the other hand, certain links with the Amudian can be seen in many of the core-reduction techniques, and in the presence of similar burin and San Remo point types in both industries, as well as in the kinds of retouch seen (nibbling and skimming retouch, for example). Perhaps further links between the Amudian and the Hummalian will emerge following a study of the large sample of the latter recovered in the April, 1982 excavation. This new occurrence is mentioned here to demonstrate the variability - hitherto unsuspected - of the facies present during what we may in general terms call the Yabrudian phase in the Levant (see Fig.4 in Copeland and Hours, 1981).

One more site, this time outside the Levant, needs to be mentioned. After finding at Haua Fteah in Cyrenaica a form of Pre-Aurignacian, the late C.B.M. McBurney studied the pre-Mousterian industries of the Near East as they were known in 1966. His 'Libyan Pre-Aurignacian' has a high laminar index, preponderance of burins and end-scrapers and hints of a bifacial element, but virtually no

backed blades. McBurney's correlation of it (1967, pp.90-100) with Yabrud I Layer 15, rather than with the Amudian, seems justified. The existence of this industry in North Africa at a time broadly equivalent to that of the comparable Levant industries confirms what the new data from El-Koum indicates, i.e. that the appearance of blades and burins in this era is not as exceptional a phenomenon as we had supposed, and that an origin 'to the north' is not mandatory.

## PAST INTERPRETATIONS

Much of the controversy over the date and meaning of the Amudian and Pre-Aurignacian has been rendered obsolete by recent advances in our knowledge. Accounts of the various positions taken are given by Solecki and Solecki (1966, p.143) and Garrod and Kirkbride (1961, p.43). For the record, we may briefly mention some of these.

At Yabrud Shelter I, Rust's choice in 1950 of the term 'Pre-Aurignacian' apparently reflected the presence of tool-types customarily thought of as Upper Palaeolithic and the fact that the earliest 'true' Upper Palaeolithic of the area, perhaps 50,000 years later, was regarded as a typical Aurignacian. As we now know, burins and end-scrapers were made in the Levant from the Lower Palaeolithic onwards and their status as hall-marks of Upper Palaeolithic technology has disappeared. However, Bordes in his turn noted the similarities of the graphs for Yabrud I Layer 15 to those for the Upper Palaeolithic at Yabrud Shelter II, and considered the Pre-Aurignacian to represent an early Upper Palaeolithic 'sans discussion possible' and 'un premier essai de pénétration des Aurignaciens vers le sud' (1955, pp.490 and 505).

Garrod and Kirkbride discussed the 'Aurignacian' aspect of the Amudian (1961, p.44) pointing out that, if there was any typological connection between it and an Upper Palaeolithic industry, it should be with the Emiran rather than with the Levantine Aurignacian. They themselves thought, however, that there was no clear evidence for any link between Amudian and Emiran. On the same subject, Perrot commented (1968, col.330-50) that, given the then minimum acceptable date for the Amudian of more than 45,000 years, an interval of at least 10,000 years separated it from the earliest European Upper Palaeolithic.

From the first, the Amudian material recovered at Abri Zumoffen did not seem to its excavators to represent a foreign or racially distinct element; they felt that the Amudians 'were perhaps not so very different from the other Middle Palaeolithic inhabitants of this region' (Garrod and Kirkbride, 1961, p.43). As workers at all three sites have observed, blade-tools persist at Tabun, Yabrud I and Abri Zumoffen in layers overlying the Amudian or Pre-Aurignacian. At Adlun, Garrod and Kirkbride noted also the indisputable association of Amudian with Yabrudian; to them this suggested a symbiotic relationship in which a closer contact had developed, so that 'the two peoples continued to live side by side for some time, perhaps as a result of inter-marriage'' (ibid., p.42); such relationships are well known to exist in the Levant to this day.

As an alternative, Garrod and Kirkbride (ibid., p.43) suggested that the blade industry could form part of the Yabrudian complex, as had originally been supposed by the excavators of Tabun. Exactly the same view was expressed by Skinner, for Yabrud I Layer 15; he had examined the Pre-Aurignacian and knew the Amudian from having assisted in the Adlun excavations (Trench B extension, 1963); for him, the Pre-Aurignacian of Yabrud 'did not present an industry at all but was a manifestation of a specialised activity within the larger (Yabrudian) assemblages of Layers 14 and 16, both of which are of the same general make-up as Yabrud I, Layer 22 and Layer 25 (1965, p.175).

At Tabun, Jelinek has from the start regarded the Amudian as possibly a 'specialised aspect of the Yabrudian' (Jelinek et al., 1973, p.174). His study of the larger sample found concentrated in Bed 75I (revised stratigraphy) now leads him to speak of the Amudian as being perhaps a 'third facies of the Mugharan Tradition' (1981, p.21). He suggests that the Amudian may eventually be explained through its apparent association with more markedly pluvial/glacial conditions.

Our general conclusions concerning Abri Zumoffen will be found in Chapter 8.

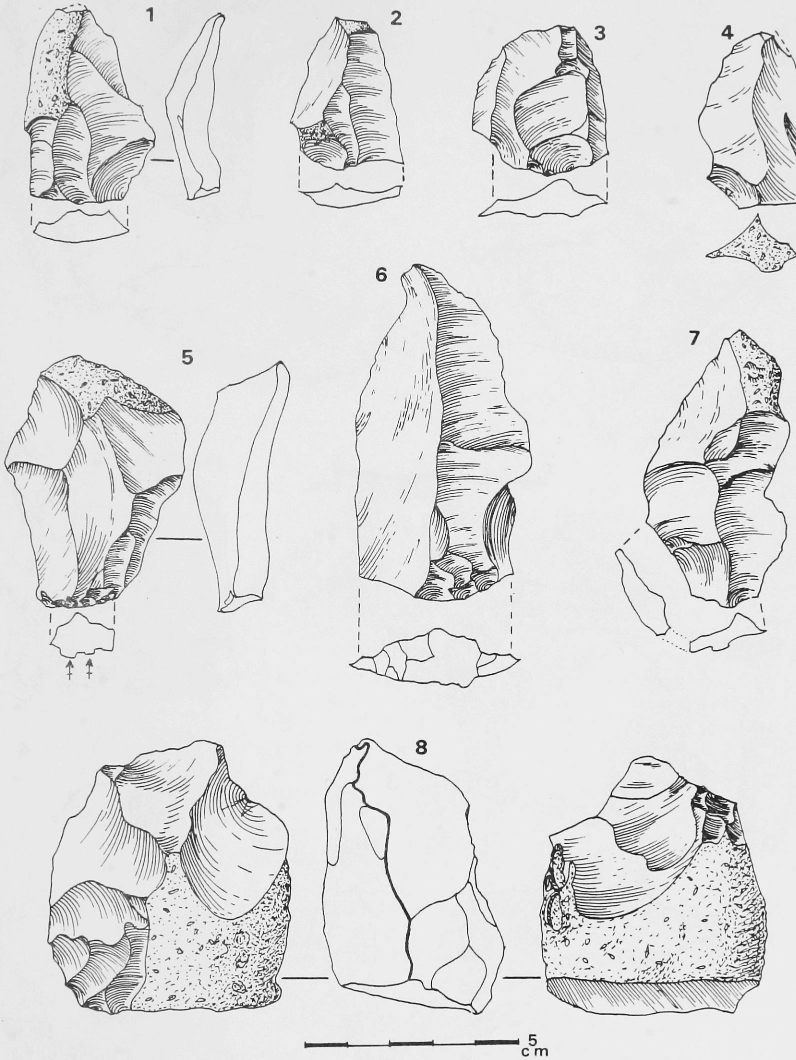



Plate Z.1. Beach Industry, Trench A, Square S-T. 1, unretouched flake of Nummulitic flint with cortex butt. 2, similar, with plain butt. 3, thinning-flake, curved, with plain butt. 4, unretouched cortex-tipped flake, thick butt. 5, unretouched elongated flake, faceted butt. 6, thinning-flake with core-edge extension of butt. 7, non-Levallois thinning-flake, some cortex, plain lipped butt. 8, chopping-tool, convex edge, on broken Nummulitic flint pebble.

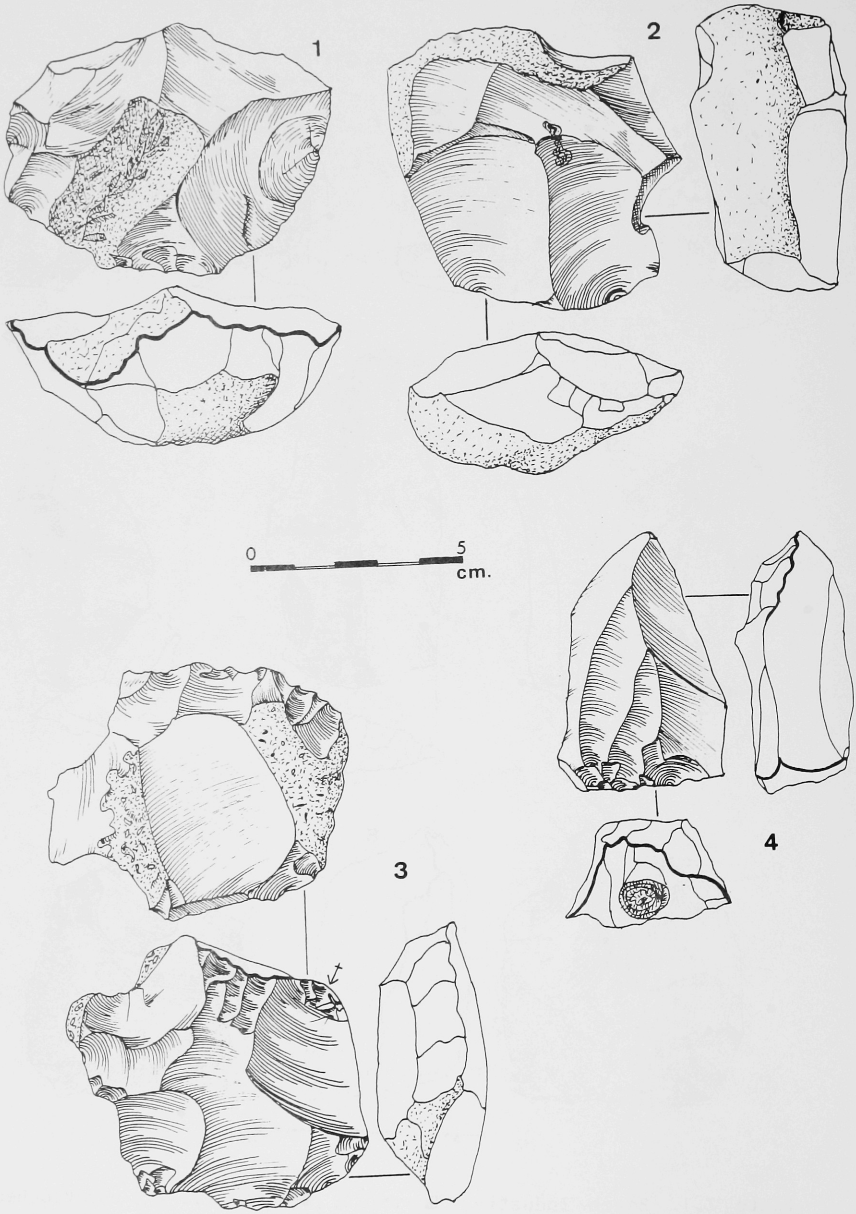



Plate Z.2. Beach Industry, Trench A, Square S-T. 1, worked out discoid core, probably ex-Levallois, with a fracture area on one surface. 2, prismatic core, Type 1, for flake-blades, plain striking-platform. 3, core, polyhedric or discoid. 4, small prismatic unipolar blade-core, type 2, with faceted striking platform containing a géode.

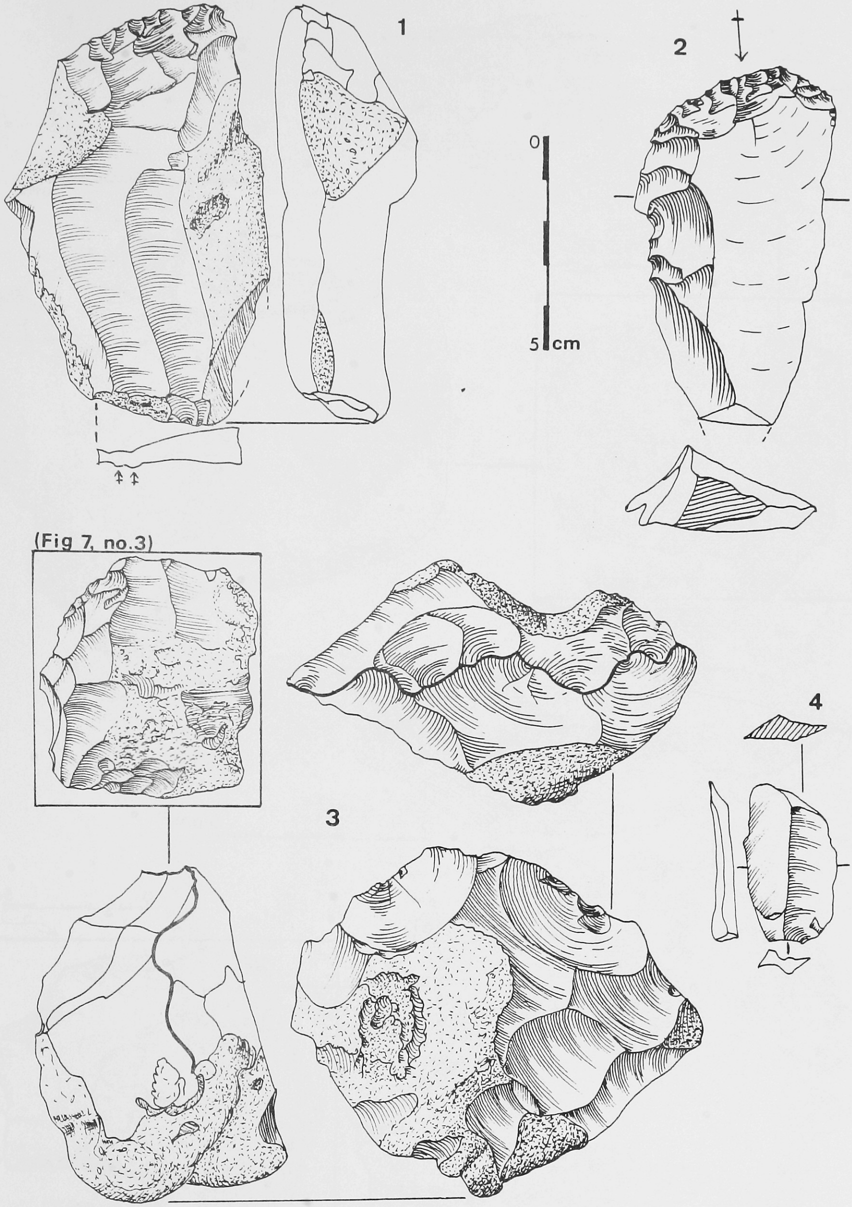



Plate Z.3. Beach Industry, Trench A, Square S-T. 1, rabot, passing to a carinated end-scraper, on a massive flake. 2, end-scraper made on the inverse side of the butt of a heavy core-edge flake (core-preparation forming one lateral edge). 3, discoid chopping tool on an irregularly shaped Nummulitic pebble - re-drawn from Fig.7, no.3 of Garrod and Kirkbride, 1961. 4, thin semi-Levallois blade, tip broken off, pronounced bulb.

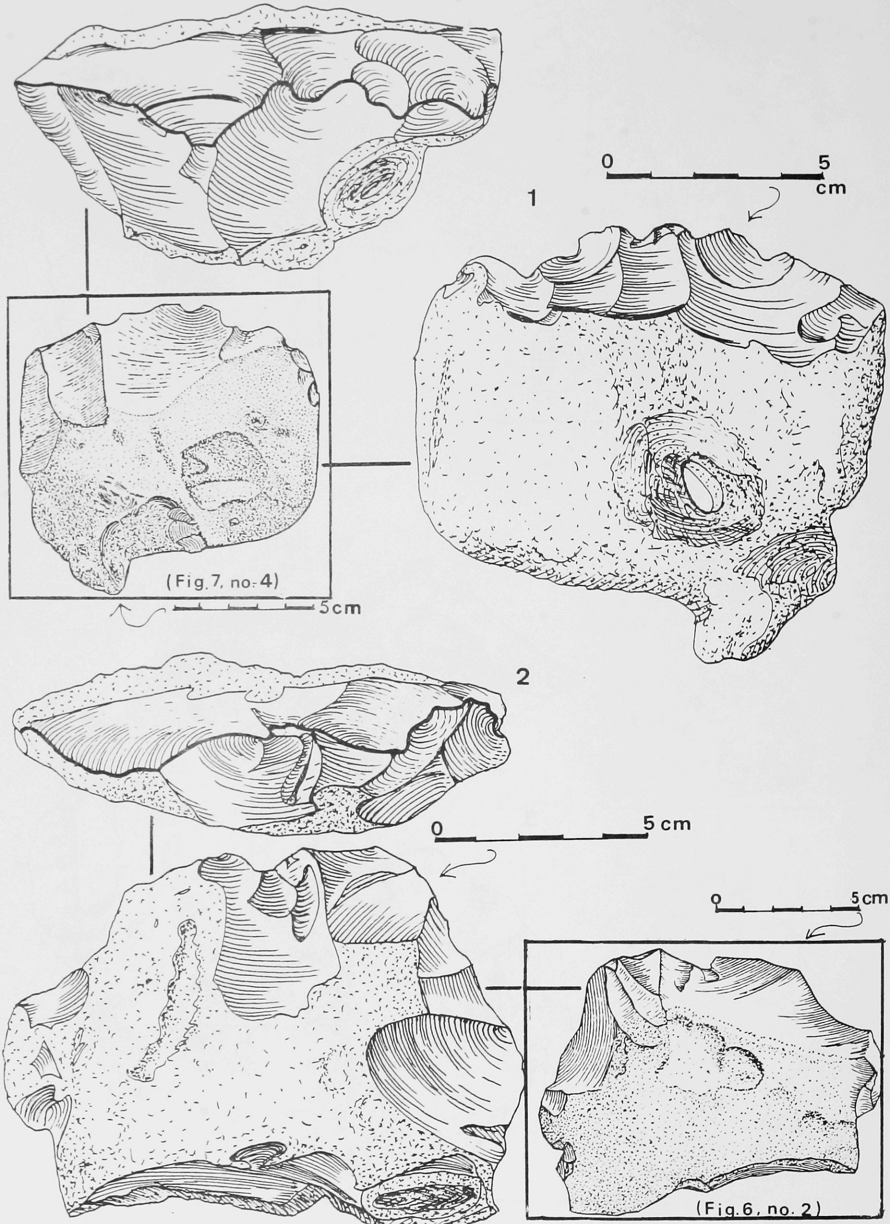



Plate Z.4. Beach Industry, 1 from A, N-O, 2 from A, S-T. 1, chopping-tool on irregular-shaped tabular Nummulitic nodule; re-drawn from Fig.7, no.4 of Garrod and Kirkbride, 1961. 2, chopping-tool on tabular Nummulitic slab re-drawn from Fig.6 no.2 of Garrod and Kirkbride, 1961. Both pieces have rough, convex, sinuous chopping-edges.

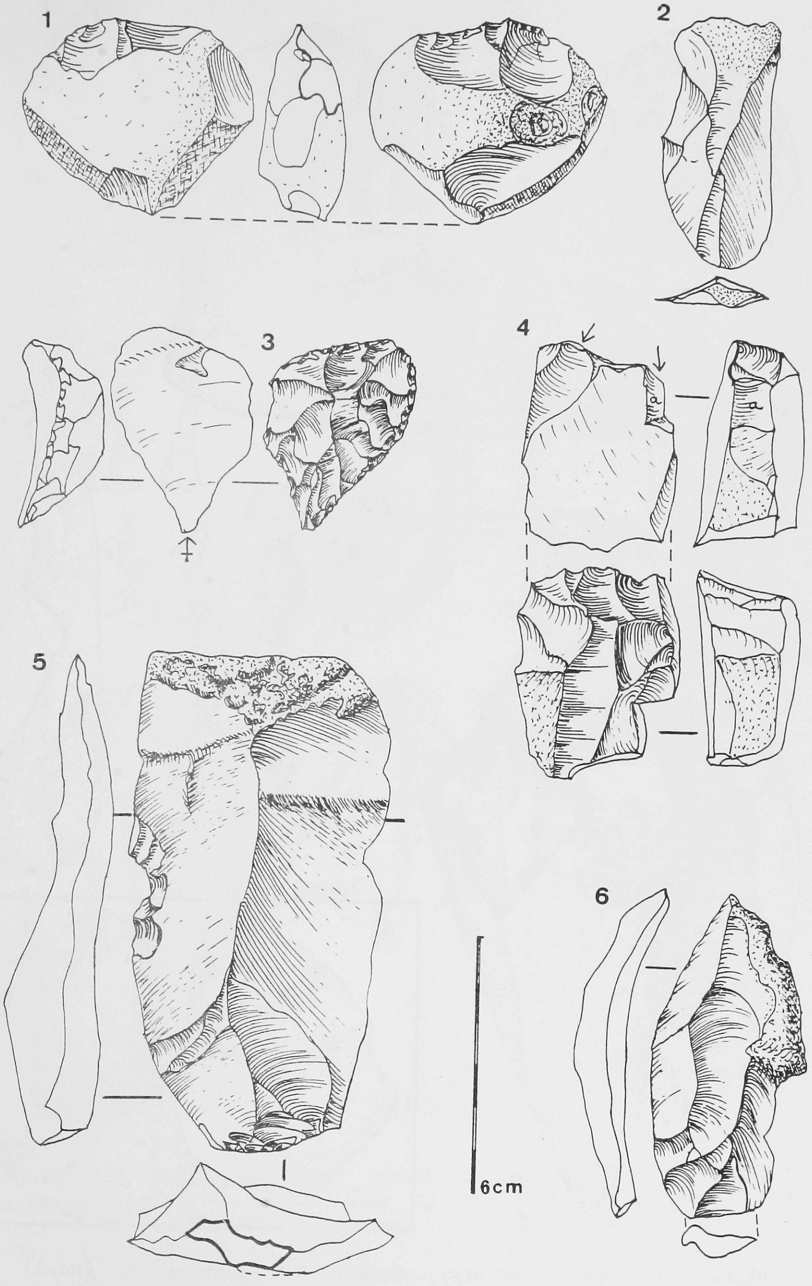



Plate Z.5. Beach Industry, Trench A, Square P-Q. 1, chopping-tool on a flat, broken pebble. 2, small unretouched blade with cortex tip and butt. 3, offset racloir on a biface thinning-flake (note pin-bulb and pronounced curvature). 4, composite tool: a double Adlun burin opposed to a carinated end-scraper with denticulated facets, made on a thick flake. 5, notched piece on a large, cortex-tipped blade. 6, naturally-backed knife; the blank is an elongated thinning-flake with lipped butt.

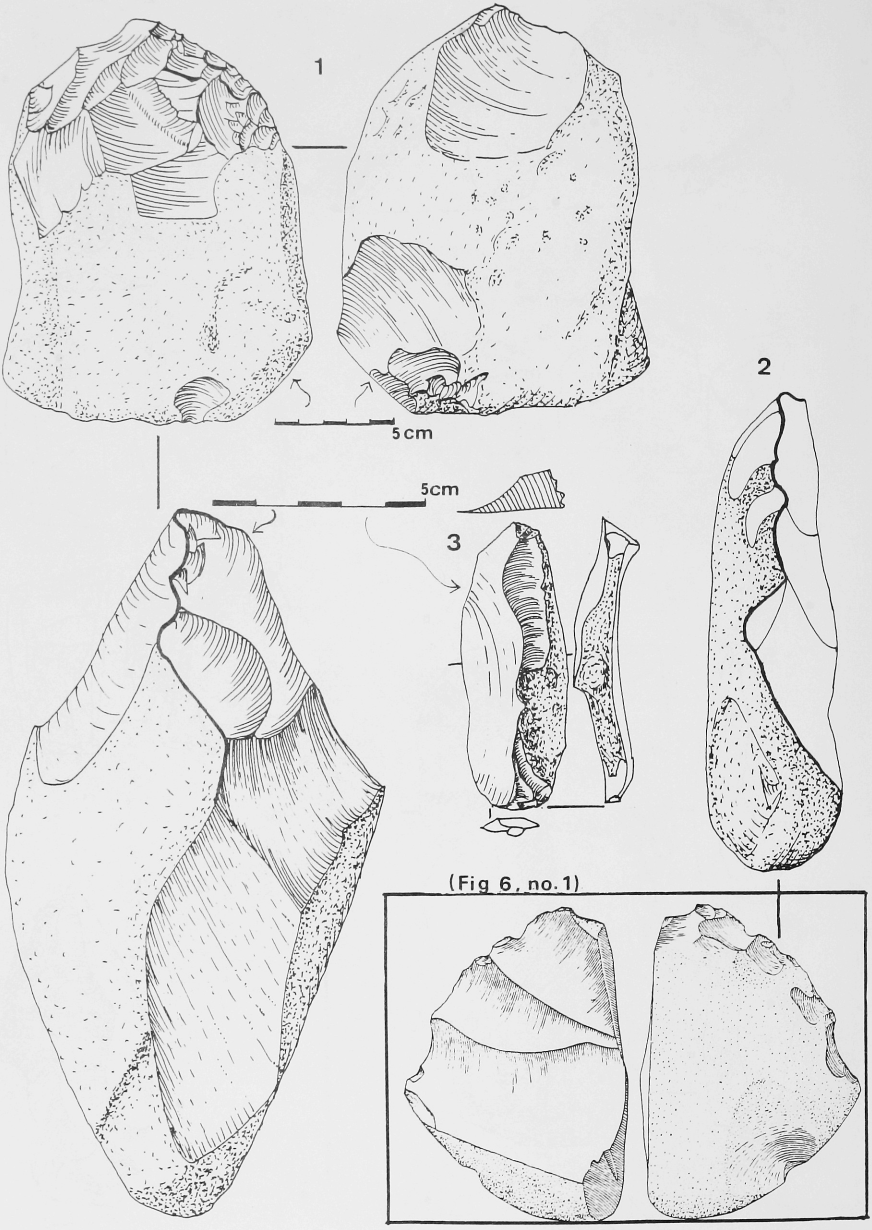



Plate Z.6. Beach Industry, Trench B, Squares L-Q (no.3) and Zumoffen Cave (nos.1, 2). 1, massive chopping-tool on a large flat Nummulitic flint cobble measuring 16.5 x 12.2 x 8.1cm., with two patinas (one may represent an accidental break); the chopping-edge is slightly sinuous in profile, and a rounded point in plan; one side of the edge is finely retouched. 2, chopping-tool or summary blade-core on flat, oval Nummulitic flint pebble split up one side. 3, plunging-blade with cortex-back, used as naturally-backed knife.

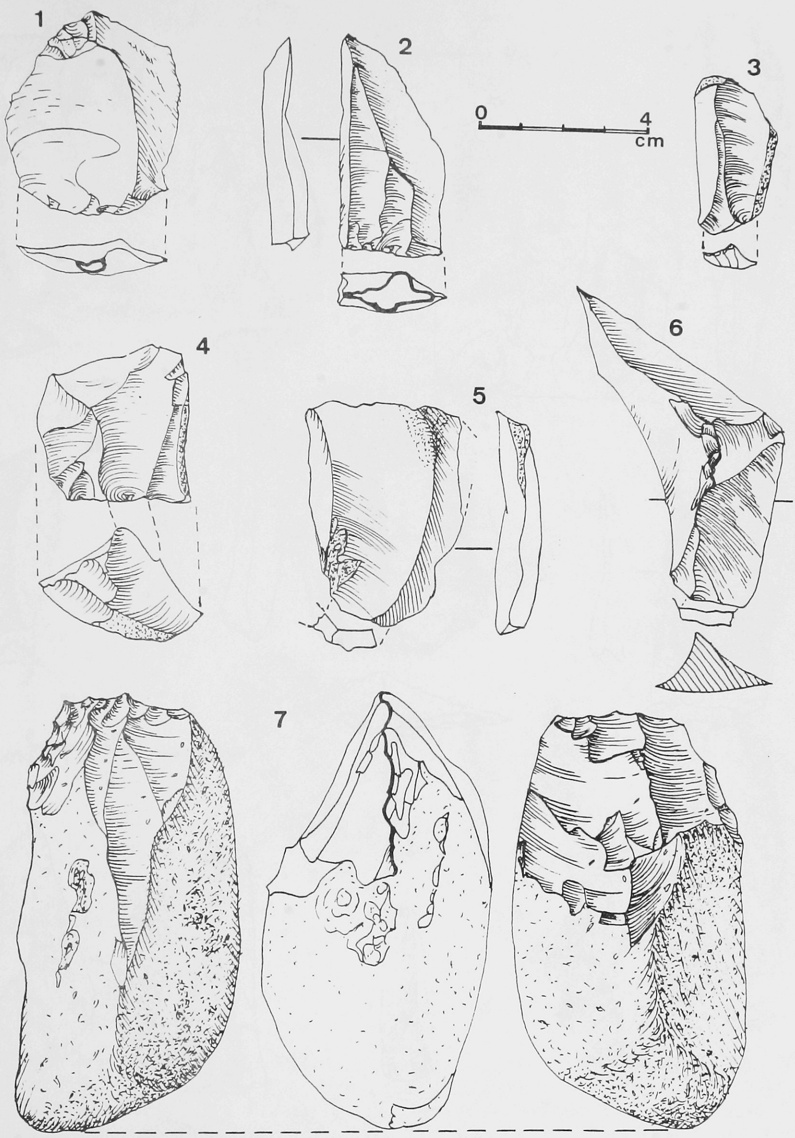



Plate Z.7. Beach Industry, Trench C, layer 4. 1, end-scraper, atypical, grey patinated matt flint, small plain butt; some semi-abrupt retouch. 2, naturally-backed knife on a pointed, grey flint flake struck from a type 3 prismatic blade-core, butt angle 115°. 3, semi-Levallois (atypical in having patches of cortex) flake of chocolate flint, with faceted butt at 95° angle. 4, prismatic core, type 2, passing to summary Levallois, for short blades, with faceted striking-platform. 5, unretouched broad non-Levallois flake, white patinated flint, butt angle 120°. 6, crested blade from a (?ridge) core, of grey patinated flint, triangular in section, butt angle 100°. 7, chopping-tool at tip of elongated pebble of grey flint with chalk cortex; one part of chopping edge is finely retouched on one side.

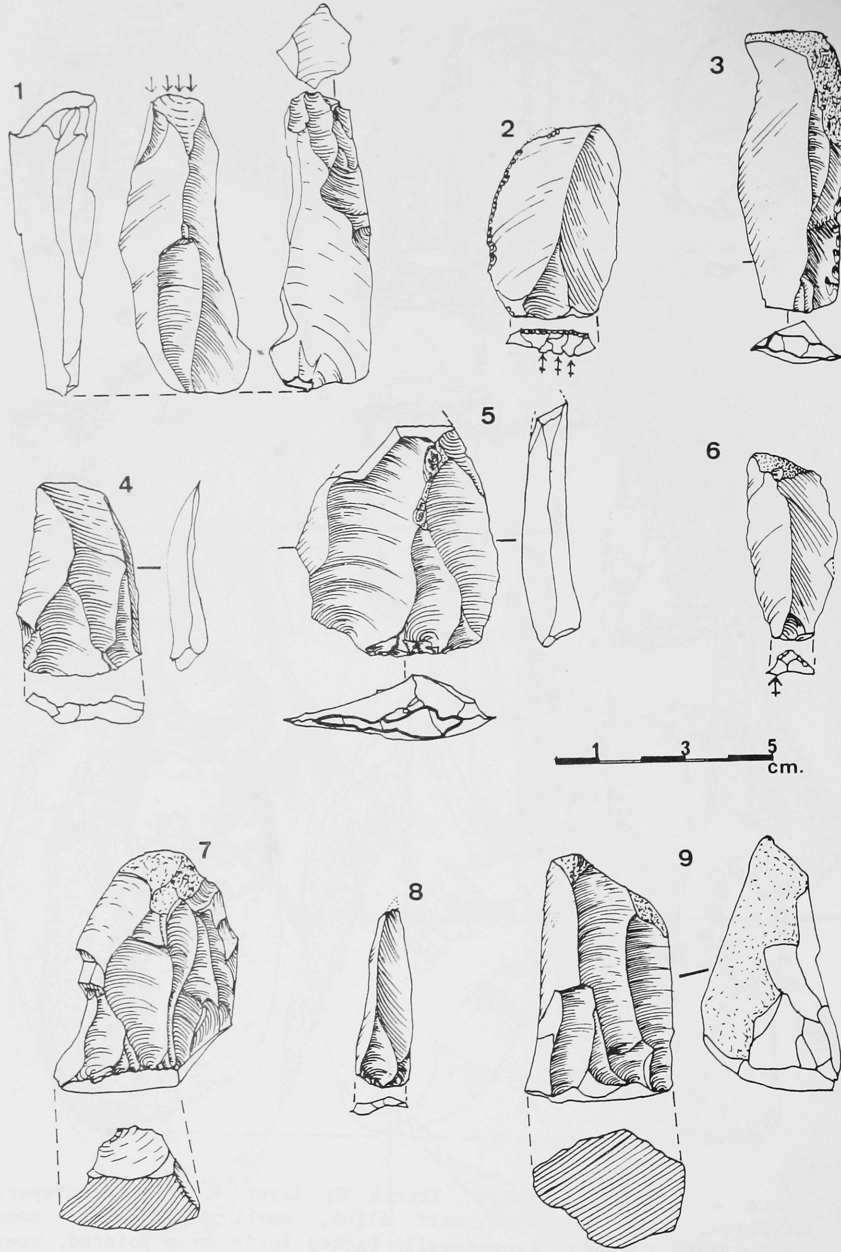



Plate Z.8. Amudian, Trench C, layer 3 (nos.1-6, 8); layer 2 (no.7); layer 1 (no.9). 1, right-angle dihedral burin of grey flint, one spall taken off distal end and three spalls struck off downward on to flake-surface. 2, backed knife with nibbled retouch on a semi-Levallois flake of chocolate patinated flint, butt angle 100°. 3, atypical backed knife; cortex forms upper back, nibbled retouch near proximal end, butt angle 115°; Nummulitic flint. 4, unretouched pseudo-Levallois thinning-flake with core-preparation back; classed as a naturally-backed knife. 5, unretouched semi-Levallois flake, of grey and white flint, broken at the tip, butt angle 120°, simply faceted butt. 6, unretouched semi-Levallois blade, with cortex at tip and asymmetrical butt. 7, core, prismatic, type 3, for bladelets, with refreshed striking-platform. 8, elongated semi-Levallois pointed blade of grey flint. 9, unipolar prismatic core, type 3, for blades or bladelets.

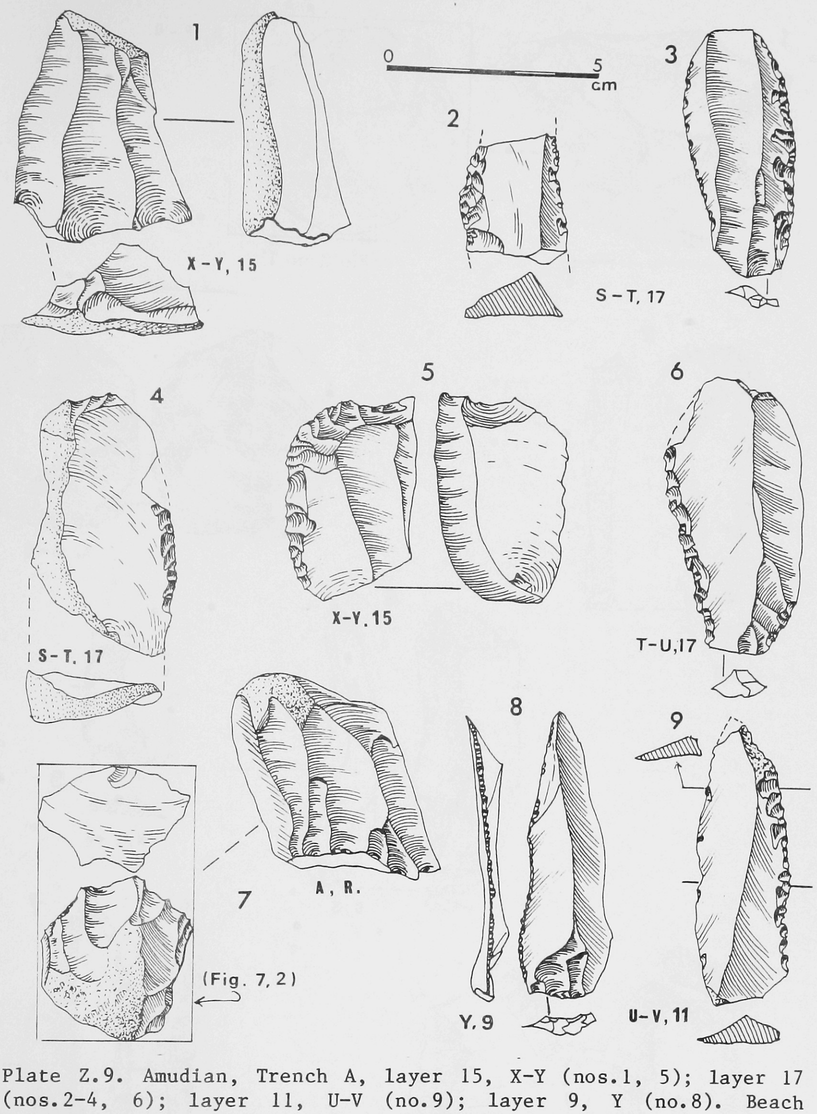



Plate Z.9. Amudian, Trench A, layer 15, X-Y (nos.1, 5); layer 17 (nos.2-4, 6); layer 11, U-V (no.9); layer 9, Y (no.8). Beach Industry, Trench A, R (no.7). 1, unipolar prismatic core, Type 2, simply-faceted striking-platform, for blades. 2, fragment of double racloir (straight/convex), on thick blade with triangular section. 3, single convex racloir, intact, flat scalar retouch, on a thin blade. 4, inverse single convex racloir, with edge broken but retouch also on distal end. 5, composite; Adlun burin at distal end of thick flake, the vertical burin spall removed part of butt; slightly denticulated racloir on one edge. 6, denticulated racloir on a blade with broken tip. 7, unipolar prismatic core for small blades, type 3, re-drawn from Fig.7, no.2 of Garrod and Kirkbride, 1961. 8, typical backed knife with nibbled retouch, on an elongated semi-Levallois blade. 9, atypical backed knife on a cortex blade, with slight denticulations near butt end.

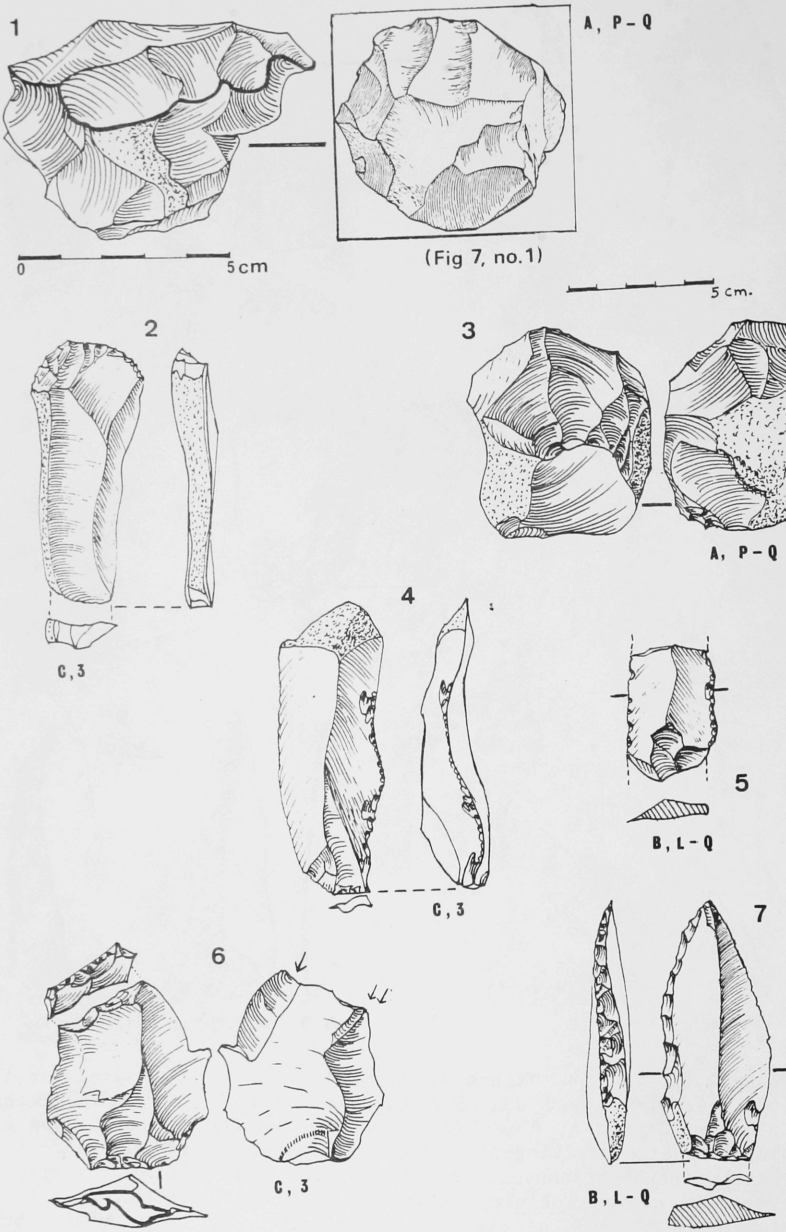



Plate Z.10. Beach Industry, Trench A, Square P-Q (no.1). Amudian, Trench C, layer 3 (nos.2-4, 6); Trench B, Squares L-Q (nos.5 and 7). 1, discoidal, globular core, re-drawn from Fig.7, no.1 of Garrod and Kirkbride, 1961; domed upper surface, deep removals have undercut lower half. 2, end-scraper on cortex-backed blade, faceted butt, patinated shiny grey flint. 3, divers core, a polyhedron with 3 distinct ridges, of brown flint. 4, retouched blade, triangular in section, cortex at tip. 5, fragment of typical backed knife, nibbled retouch on one edge, use-retouch on other edge. 6, double Adlun burin or burin on straight oblique truncation, beige flint; burin blows struck downwards at each distal corner on to ventral surface; re-drawn from Fig.3, no.5 of Garrod and Kirkbride, 1961. 7, typical backed knife on non-Levallois blade; well-made abrupt retouch to pointed and sharp tip. Note: No.3 was originally published by D. Garrod (1966b, p.47, no.4).